

Viability Assessment Report For White Pine - Hemlock Habitat Association

Prepared by
Pamela J. Martin
Daniel Boone National Forest

I. Description of Habitat Association

The White Pine-Hemlock Habitat Association occurs on mesic to somewhat dry sites over a broad range of topographic conditions including ravines, valley flats, sheltered low ridges, open north-facing slopes at high elevations, and steep exposed slopes. This association includes forest dominated by hemlock and white pine, singly or mixtures of both and associated hardwood species. Hemlock may be the dominate species in forested ravines and flats along streams at low to intermediate elevations, and at higher elevations on open north-facing slopes. White pine may share dominance in the low to intermediate elevation forests. Hemlock is also associated with mesophytic hardwoods. Water on these sites is primarily from surface sources (rainfall). On some sites, limited amounts of ground water help maintain suitable moist conditions. Sunlight, which drives photosynthesis, is the major source of energy. Fire has historically had little impact on eastern hemlock. However, decay of vegetation and byproducts of fires passing through the White Pine-Hemlock Habitat Association does provide energy sources. Pit and mound microtopography is also characteristic of this habitat association. Currently, the hemlock wooly adelgid, an exotic insect is causing widespread mortality among eastern hemlocks. This infestation is not currently a forest health problem on the Daniel Boone National Forest (USDA Forest Service, 1997).

The Daniel Boone National Forest (DBNF) occurs in three ecological sections: Northern Cumberland Plateau, Interior Low Plateau and Highland Rim and Cumberland Mountains. The White Pine-Hemlock Habitat Association occurs in all three of these ecological sections.

In the Northern Cumberland Plateau of the DBNF, white pine-hemlock habitat occurs in the following landtype associations (LTAs) (USDA Forest Service, 1997a; 1996):

- Northern Escarpment (221Hb004)
- Northern Low Hills/Cliff Transition (221Hb005)
- Northern Rolling Hills (221He003)
- North Fork Kentucky Cliffs (221Hb003)
- Central Cliff (221Hb002)
- London-Corbin Plain Transition (221Hc007)

- Rolling Low Hills (221He001)
- Low Hills (221He002)
- Low Hills-Rugged Hills Transition (221Ha002)
- Southern Middle Breathitt Rugged Hills (221Ha001)
- London-Corbin Plain (221Hc006)
- Rockcastle Hills (221Hc005)
- Southern Cliff (221Hc003)
- Big South Fork Plateau (221Hc004).

On the DBNF, Interior Low Plateau and Highland Rim, white pine-hemlock habitat occurs in the following LTAs (USDA Forest Service, 1997a; 1996):

- Triplett Creek Knobs (222En002)
- Knob Flats (222En001).

In the Cumberland Mountain ecological section, of the DBNF, white pine-hemlock habitat occurs in the following LTA (USDA Forest Service, 1997a; 1996):

- Northern Jellico Mountains (M221Cd001).

On the DBNF, the white pine-hemlock forest type is concentrated on steep colluvial slopes with Jefferson soils derived from sandstone, mostly in narrow ravines or on lower north-facing slopes. In addition to the dominant hemlock, other characteristic trees include white pine, birches, magnolias and American holly, most of which are more common in transitional or disturbed phases. White pine is often co-dominant in the canopy, but rare in the understory. The dominant shrub is typically rhododendron; mountain pepperbush and buffalo nut are also frequent. The herbaceous layer is usually sparse, however, the most abundant herbaceous species include New York fern, sweet white violet, and partridge berry. Other characteristic associates include shining clubmoss, rockcap fern, and Indian cucumber root. Species that can be observed in the transition to beech-yellow-poplar or sugar maple include foamflower and meehania. Other species typical of the transition zone include, black cohosh, hepatica, spring beauty, slender toothwort, goldenrod, yellow mandarin, erect trillium and crested dwarf iris (USDA Forest Service, 1989).

II. Current Status of the Habitat Association on the Daniel Boone National Forest

The white pine and hemlock forest types on the DBNF are tracked in the Continuous Inventory of Stand Conditions (CISC) and are represented as white pine (03), white pine - hemlock (04), and hemlock (05). The management codes in this forest type, white pine-hemlock, are defined as follows (USDA Forest Service, 1992):

(03) = 70+ percent of the dominant and co-dominant basal area (BA) is softwood, and white pine is the predominant softwood;

(04) = 70+ percent of the dominant and co-dominant BA is softwood, and white pine and hemlock each have at least 10 BA, and together are the predominant softwoods; and

(05) = 70+ percent of the dominant and co-dominant BA is softwood, and hemlock is predominant (and the stand contains greater than 10 BA of white pine).

The CISC database was queried to determine occurrence of these forest types on the landscape. The Daniel Boone National Forest has approximately 665,000 acres of forested land. Of this acreage, approximately 1 percent or 9,312 acres are within the white pine-hemlock forest type as described. Table 1 shows the forest types of white pine-hemlock habitat on the DBNF separated by age class (USDA Forest Service, 1998).

Table 1. Forest types within the White Pine–Hemlock Habitat Association by age and acres.

AGE	WHITE PINE (03) ACRES	WHITE PINE- HEMLOCK (04)	HEMLOCK (05) ACRES
0-10	818	0	0
11-20	2203	0	0
21-30	1673	44	86
31-40	1281	0	216
41-50	231	33	122
51-60	61	0	45
61-70	73	36	38
71-80	269	24	109
81-90	43	0	117
91-100	0	209	103
101-110	225	47	325
111-120	0	0	373
121-130	0	0	62
131-140	0	0	189
141-150+	0	0	257
TOTAL	6877	393	2042

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The desired future condition for this habitat association would be to provide amounts of suitable habitat in the proper stages of succession to ensure that the species dependant on the association have a high probability of persistence on the forest. This would involve maintaining a structured age class distribution with emphasis on maintaining a large component of habitat that contains the habitat modifiers required by various species.

- Evaluate habitats to determine those capable of supporting reintroduction of species at risk.
 - *Rationale: Specific species management within this habitat association may require reintroduction efforts to ensure continued persistence of that particular species or group of species in this association.*
- White pine-hemlock needs to be represented in a range of age classes.
 - *Rationale: White pine-hemlock makes up approximately 1 percent of the forest type on the DBNF. The species identified in this habitat association require a variety of age classes, elevations and tract sizes. Species from the wood thrush, which requires a minimum tract size of 3 hectares (7.43 acres) to the Acadian flycatcher, which prefers forested tract sizes of 37 hectares (91.4 acres) of mesophytic cove habitats greater than 80 years old. A range of age classes, along with their accompanying attributes, is a necessary component of this habitat association. It is presumed that with a range of age classes, specifically older age stands and their attributes, i.e. decorticated logs which are utilized by *Nowellia curvifolia*, the species identified in this habitat association will continue to persist on the forest.*
- Where applicable, leave project unit boundaries with irregular and feathered edges
 - *Rationale: Abrupt habitat changes can create barriers to wildlife passing through the unit.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

Monitoring and inventory of the White Pine-Hemlock Habitat Association will need to be implemented at a level sufficient to provide data to track the current condition of the habitat. The following items are considered necessary to ensure that the association can be properly evaluated and decisions supported.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 years. Stand (or analysis unit) inventory should also be conducted in response to events that have potential to alter the landscape i.e., windstorms, winter storms, insect and disease infestations (high priority).
 - *Rationale: Inventory to identify and update baseline data or assess changed conditions after non-prescribed major disturbances. Inventory may be at the stand level or larger units may be used (such as ecological or habitat units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*
- Employ GIS and vegetation management databases to track the condition and composition of the White Pine-Hemlock Habitat Association (high priority).

- *Rationale: The use of FSVeg (CISC or best available science) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the pine habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers.*
- Continue to implement R8 landbird monitoring program (high priority).
 - *Rationale: This monitoring program will help track the persistence of the avian species in this habitat association. This may be a critical element in documenting avian species trends in this association.*

References:

- USDA Forest Service. 1996. Landtype association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1997. Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region: report of the Region 8 Old-Growth Team. Forestry Report R8-FR 62. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta, GA. 117p.
- USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 1998. Continuous inventory of stand condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1989. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stanton Ranger District. Winchester, KY. 316 pp.

07/15/2003

Attachment A.

Species List: White-Pine Hemlock Habitat Association

Class	Common Name/ Species
ANIMALS	
Birds	Sharp-shinned Hawk/ <i>Accipiter striatus</i> Acadian Flycatcher/ <i>Empidonax virescens</i> Wood Thrush/ <i>Hylocichla mustelina</i> Swainson's Warbler/ <i>Limnothlypis swainsonii</i> Red-breasted Nuthatch/ <i>Sitta canadensis</i>
PLANTS	
Liverworts	Liverwort/ <i>Nowellia curvifolia</i>
Monocots	Pink Lady's-slipper/ <i>Cypripedium acaule</i>
Mosses	Feather Moss or Log Moss/ <i>Hypnum curvifolium</i> Feather Moss or Log Moss / <i>Hypnum imponens</i> Fern Moss or Log Moss / <i>Thuidium delicatulum</i>

Attachment B.

White Pine-Hemlock Species/Habitat Relationships with References

ANIMALS

Birds

Sharp-shinned Hawk – *Accipiter striatus* – Although this species is known to use a mixture of hardwoods and conifers, pines and hemlock seem to be preferred for nesting and over-wintering in Kentucky. The typical nesting site is in the canopy of a large, mature pine or hemlock within an extensive tract of forest. Sharp-shinned hawks are also observed (e.g., when foraging) within areas having a mix of forested and semi-open habitat; however, they more frequently occupy heavily forested areas (Hamel, 1992). Thus, year-round, the existence of tracts of mature forest is of prime importance to the species.

Acadian Flycatcher – *Empidonax virescens* – This species is usually found near water, generally near a stream course or some small waterway (Hamel, 1992). It generally uses an open, moderate understory for feeding in a stand with tall trees and closed canopy (DeGraaf et. al., 1991). It is associated with forested tracts at least 37 hectares (91.4 acres) in size (Hamel, 1992). DBNF monitoring data indicates that the greatest number of occurrences for this species were in mesophytic-cove habitats greater than 80 years old. The acadian flycatcher is particularly fond of the shaded, moist coves dominated by hemlocks and adjacent to small streams (L.Perry, pers. obs.)

Wood Thrush – *Hylocichla mustelina* – The wood thrush is found in a wide variety of forest types, provided a well-developed understory is present. Moderately shaded, deciduous and mixed stands of mature trees with a dense shrub and/or sapling understory are typical habitat, particularly when occurring on moist sites. Rich hardwood and bottomland forests are favored; however, drier sites may be used, so long they have the relatively dense shrub layer. Nesting is in shrubs, vines, and small trees. Although the species will tolerate some fragmentation of habitat, it is most common in extensive forest and requires a minimum tract size of 3 hectares (Hamel 1992). This species would be particularly attracted to the white pine-hemlock forest due to the damp, shaded conditions frequently associated with it.

Swainson's Warbler – *Limnithlypis swainsonii* – This forest interior species is found within tracts of moist, extensive forest that have dense understory (Palmer-Ball, 1996). Hemlock ravines, having dense growths of rhododendron and laurel, and bottomland forest, with a well-developed understory and/or thickets of small trees, are favored locations. Dense cane breaks are also used. On the DBNF, this bird is often observed in damp, shady hemlock ravines with an understory of rhododendron, near small streams (L.Perry, pers. obs.).

Red-breasted Nuthatch – *Sitta canadensis* – Though this nuthatch is dependent on coniferous habitat, its requirements vary considerably between seasons. It generally breeds at elevations above 3500 feet, in dead spruce or fir trees. Occasionally it will nest in hemlock and, rarely, in pine. Suitable snags (dead trees) are greater than 6" dbh (six inch diameter at breast height). Mature stands are favored. The red-breasted nuthatch prefers to overwinter in dense stands of

conifers and pine-oak. During this time, the birds are not particular to age class so much as to stand density. On the DBNF, when these birds are encountered in winter, it is almost always while feeding in pines—especially mature virginia pines having a lot of cones (L. Perry, pers. obs.). The red-breasted nuthatch is particularly attracted to white pine forests during its nesting season, where it gathers white pine resin to smear on the face of its nest tree.

PLANTS

Liverworts

Liverwort – *Nowellia curvifolia* – This liverwort is widespread in northern North America, south into the Appalachian provinces, present in the high mountains of Mexico and Central America. It is found almost exclusively on decorticated logs. On the DBNF, it is found almost exclusively on decorticated eastern hemlock and yellow pine logs, usually of 10-12 inch diameter or larger. It requires moderate to heavy shade.

Monocots

Pink Lady's-slipper – *Cypripedium acaule* – Across its range, it occurs in acid forests or wetlands (usually sphagnum bogs). On the DBNF, pink lady's-slipper is found in upland oak and mixed pine-oak woods, and occasionally on hummocks within seeps and streamhead wetlands. It occurs in light to heavy shade, but does not seem to flower unless in somewhat open conditions. This species responds well to burning. It is not uncommon to find 3-4 dozen plants in flower and as many more in vegetation condition following a fire where only a dozen or so were found before. The species is experiencing collection pressure from root diggers. Digging of this species is not permitted on the DBNF.

Mosses

Feather Moss or Log Moss – *Hypnum curvifolium* – It has a wide distribution in North America. The species is uncommon to common and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Feather Moss or Log Moss – *Hypnum imponens* – It has a wide distribution in North America. The species is common to abundant and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Fern Moss or Log Moss – *Thuidium delicatulum* – This moss is a northern US and Canadian species which extends southward in the eastern US to the Gulf coast (and south to northern South America). It is a usually common species in its habitat, which is on moist soil, humus, rocks, or logs in forest or sometimes meadows or fields. On the DBNF, it is most common in mixed mesophytic forest on rocks, logs and soil, but is also found in dry-mesic forest, and rarely in

xeric forest. It also occurs on the DBNF in old fields and meadows, sometimes in ruderal areas. This species is widely collected for the horticultural industry and in some areas is becoming scarce.

References:

- DeGraaf R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and Rangeland Birds of the United States - Natural History and Habitat Use. USDA Agriculture Handbook 688. 625 pp.
- Hamel, Paul B. 1992. Land Manager's Guide to Birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky, Lexington, KY. 372pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.

07/15/2003

Attachment C.

White Pine-Hemlock Association Matrix

Association	Habitat	Modifier	Class	Common/Species
1-W. Pine-Hemlock	W. Pine-Hemlock Forest	(blank)	P-MON	Pink Lady-slipper/ <i>Cypripedium acaule</i>
		Acidic Substrate	P-MOS	Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>
		Closed Forest Canopy	BIRD	Acadian flycatcher/ <i>Empidonax virescens</i>
		Dense shrub understory		Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
				Wood Thrush/ <i>Hylocichla mustelina</i>
		Downed Logs	P-MOS	Feather Moss, Log Moss/ <i>Hypnum imponens</i>
		Downed Logs (minimum size)	P-LIV	Liverwort/ <i>Nowellia curvifolia</i>
		Elevation (above 2300 ft)	BIRD	Red-breasted Nuthatch/ <i>Sitta canadensis</i>
		Forest Interior (Minimal Edge)		Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		High Shade		Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
			P-MOS	Feather Moss, Log Moss/ <i>Hypnum curvifolium</i>
		Large Decadent Trees	BIRD	Sharp-shinned Hawk/ <i>Accipiter striatus</i>
		Mature forest		Red-breasted Nuthatch/ <i>Sitta canadensis</i>
				Wood Thrush/ <i>Hylocichla mustelina</i>
		Mid-age Forest		Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		Moderate Shade		Wood Thrush/ <i>Hylocichla mustelina</i>
			P-MOS	Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>
		Moist	BIRD	Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
			P-MOS	Feather Moss, Log Moss/ <i>Hypnum curvifolium</i>
				Feather Moss, Log Moss/ <i>Hypnum imponens</i>
				Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>
		Open Midstory/Understory	BIRD	Acadian flycatcher/ <i>Empidonax virescens</i>
		Rocky/Rocks	P-MOS	Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>
		Snags > 6" dbh	BIRD	Red-breasted Nuthatch/ <i>Sitta canadensis</i>
		Tract Size (Area Sensitive)		Acadian flycatcher/ <i>Empidonax virescens</i>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		Tree and Snags (Cavity Nesters)		Red-breasted Nuthatch/ <i>Sitta canadensis</i>
		Water (Distance Sensitive)		Acadian flycatcher/ <i>Empidonax virescens</i>

Viability Assessment Report For Conifer-Northern Hardwood Habitat Association

Prepared by
Pamela J. Martin
Daniel Boone National Forest

I. Description of Habitat Association

The Conifer-Northern Hardwood Habitat Association is found in the northern tier of states from Minnesota to Maine southward along the Appalachian Mountains to North Georgia. The hemlock-northern hardwood forest is dominated by eastern hemlock and hardwood species associated with cooler, moister conditions. This forest type develops best on cool, moderately wet to somewhat poorly drained sites. Main associates are sugar maple, American beech, red maple, and eastern white pine. Soil tends to be acidic with surfaces consisting mostly of needles and twigs. Hemlocks greatly limit the amount of light reaching the forest floor, which in turn results in sparse understory vegetation. The exception is in early successional stages and in canopy gaps, where abundant understory vegetation exists (USDA Forest Service, 1997). The white pine-northern hardwood forest is closely related to historical fire patterns, largely occupying the drier end of the conifer-northern hardwood complex. Common associates include red maple and northern red oak on dry sites and sugar maple, beech, white ash, and hemlock on moist sites (USDA Forest Service, 1997).

The Daniel Boone National Forest (DBNF) occurs in three ecological sections: Northern Cumberland Plateau, Interior Low Plateau and Highland Rim and Cumberland Mountains. On the DBNF, conifer-northern hardwood habitat occurs in all three of these ecological sections. The majority of the conifer-northern hardwood habitat on the DBNF occurs in the Northern Cumberland Plateau ecological section. In the Northern Cumberland Plateau, conifer-hardwood habitat occurs in the following landtype associations (LTAs) (see USDA Forest Service, 1997a; 1996):

- Southern Middle Breathitt Rugged Hills (221Ha001)
- Big South Fork Plateau (221Hc004)
- Southern Knobstone Escarpment Transition (221Hc002)
- Rolling Low Hills (221He001)
- Central Cliff (221Hb002)
- Central Knobstone Escarpment (221Hb001)
- Northern Rolling Hills (221He003)

- Low Hills-Rugged Transition (221Ha002)
- North Fork Kentucky Cliffs (221Hb003)
- Northern Low Hills/Cliff transition (221Hb005)
- Southern Cliff (221Hc003)
- Rockcastle Hills (221Hc005)
- London-Corbin Plain Transition (221Hc006)
- Northern Escarpment (221Hb004).

Within the Interior Low Plateau and Highland Rim section, conifer-northern hardwood habitat occurs in the following LTA (USDA Forest Service, 1997a; 1996):

- Triplett Creek Knobs (222En002) LTA.

Within the Cumberland Mountain ecological section, conifer-northern hardwood habitat occurs in the following LTA (USDA Forest Service, 1997a; 1996):

- Northern Jellico Mountains (M221Cd001) LTA (USDA, 1997a; 1996).

On the DBNF, the Conifer-Northern Hardwood Habitat Association occurs on mesic to somewhat xeric sites over a broad range of topographic conditions including ravines, valley flats, sheltered low ridges, open north-facing slopes at high elevations, and steep exposed slopes. The conifer-northern hardwood forest is dominated by hemlock and white pine singly or mixed with associated hardwood species. Hemlock may dominate forested ravines and flats along streams at low to intermediate elevations, and at higher elevations, on open north-facing slopes. White pine may share dominance in the low to intermediate elevation forests, or hemlock may be associated with mesophytic hardwoods, particularly yellow poplar. Shrub layers are typically ericaceous, with common occurrence of rhododendron and laurel. The herb layer may include Halberd-leaved yellow violet, foamflower and Christmas fern. White pine seldom forms pure stands, but does mix with hemlock along streams and with oaks such as, northern red oak, white oak, chestnut oak, black oak, and scarlet oak on upland slopes. The shrub layer may be dense, dominated by rhododendron, blueberry, and/or mountain laurel. Herbaceous cover is usually sparse or absent (SAMAB, 1996).

Water on these sites is primarily from surface sources (rainfall). On some sites, limited amounts of ground water help maintain the sites. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the Conifer-Northern Hardwood Habitat Association, also provide energy sources. For conifer-northern hardwood forest, windthrow is a particularly common disturbance on many sites due to high water tables, which limit the downward expansion of roots. This type of disturbance allows for frequent gap phase regeneration. Pit and mound microtopography is also characteristic. Fire has historically had little impact on eastern hemlock. However, the

hemlock woolly adelgid, an exotic insect is causing widespread mortality among eastern hemlocks in the South (USDA Forest Service, 1997). This infestation is not currently a forest health problem on the DBNF.

II. Current Status of the Habitat Association on the Daniel Boone National Forest

The conifer–northern hardwood forest types on the DBNF are tracked in the Continuous Inventory of Stand Conditions (CISC) and are represented as hemlock-hardwood (08), white pine–cove hardwood (09), white pine–upland hardwood (10), and upland hardwood–white pine (42). The management codes in this forest type, conifer-northern hardwood, are defined as follows:

(08) = 50 to 69 percent of the dominant and co-dominant basal area is softwood, and plurality of softwood is hemlock;

(09) = 50 to 69 percent of the dominant and co-dominant basal area is softwood, and plurality of softwood is white pine;

(10) = 50 to 69 percent of the dominant and co-dominant basal area is softwood, and at least 50 percent of the softwood is white pine;

(42) = 30 to 49 percent of the dominant and co-dominant basal area is softwood, and at least 50 percent of the softwood is white pine, and the hardwood component consists of greater than 70 percent upland hardwood species (USDA Forest Service, 1992).

On the DBNF, approximately 665,000 acres are in forested land. Of this acreage, approximately 4 percent or 24,852 acres are within the conifer-northern hardwood forest type as described. Refer to Table 1, which shows the conifer-northern hardwood forest types divided by age class and acres (USDA Forest Service, 1998).

Table 1. Forest types within the Conifer–Northern Hardwood Habitat Association by age and acres.

AGE	Hemlock – Hardwood (08)	White Pine – Cove Hardwood (09)	White Pine – Upland Hardwood (10)	Upland Hardwood – White Pine (42)
0-10	70	98	182	76
11-20	264	142	647	428
21-30	851	154	454	247
31-40	856	64	138	70
41-50	343	0	37	78
51-60	463	36	17	66
61-70	1348	91	361	112
71-80	2780	41	437	97
81-90	3063	68	31	144
91-100	3386	36	51	56

AGE	Hemlock – Hardwood (08)	White Pine – Cove Hardwood (09)	White Pine – Upland Hardwood (10)	Upland Hardwood – White Pine (42)
101-110	2367	406	130	0
111-120	1354	81	0	0
121-130	836	17	0	0
131-140	446	177	0	0
141-150+	1155	0	0	0
TOTAL	19582	1411	2485	1374

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The desired future condition for this habitat association would be to provide amounts of suitable habitat in the proper stages of succession to ensure that the species dependant on the association have a high probability of persistence on the forest. This would involve maintaining a structured age class distribution with emphasis on maintaining a significant component of habitat that contains the habitat modifiers required by various species.

- Manage habitat association by alterations and improvements coordinated through a habitat prescription process (DBNF LRMP, IV-13).
 - *Rationale: Habitat manipulation is a necessary tool in the management of this association.*
- Develop standards and guidelines specifically for the higher elevation conifer – northern hardwood sites. The intent of these guidelines would be to help ensure continued persistence of the unique high elevation forest communities on the DBNF.
 - *Rationale: Several species in this association are strongly linked to the higher elevation sites and their attributes. This habitat is limited on the DBNF and should be managed carefully to ensure continued recruitment of this forest type.*
- Conifer-northern hardwood forest types need to be represented in a range of age classes.
 - *Rationale: Conifer-northern hardwood makes up approximately 4 percent of the forest type on the DBNF. The species identified in this habitat association (plants, amphibian, mammals and birds) require a variety of age classes, elevations and tract sizes. Species from the blackburnian warbler, which requires extensive tracts of high elevation mature forest to the red-breasted nuthatch, which is known to breed at 2500 feet and beyond. A range of age classes, along with their accompanying attributes, is a necessary component of this habitat association. Age distribution management along with implementation of best management practices should ensure continued persistence of the species identified in this habitat association.*

- Where applicable, leave project unit boundaries irregular and with feathered edges.
 - *Rationale: Abrupt habitat changes can create barriers to wildlife passing through the unit.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

Monitoring and inventory of the Conifer-Northern Hardwood Habitat Association will need to be implemented at a level sufficient to provide data to track the current condition of the habitat. The following items are considered necessary to ensure that the association can be properly evaluated and decisions supported.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 years. Stand (or analysis unit) inventory should also be conducted in response to events that have potential to alter the landscape i.e., windstorms, winter storms, and infestations (high priority).
 - *Rationale: Inventory to identify and update baseline data or assess changed conditions after non-prescribed major disturbances. Inventory may be at the stand level or larger units may be used (such as ecological or habitat units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*
- Employ GIS and vegetation management databases to track the condition and composition of the Conifer-Northern Hardwood Habitat Association (high priority).
 - *Rationale: The use of FSVeg (CISC or best available science) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the pine habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers.*
- Continue to implement R8 landbird monitoring program (high priority).
 - *Rationale: This monitoring program will help track the persistence of the avian species in this habitat association. This may be a critical element in documenting avian species trends in this association. This monitoring program contains points linked to this association it would be considered an excellent tool for both species-specific and association monitoring.*

- Identify land parcels that may become available for acquisition (moderate priority).
 - *Rationale: In this habitat association, high elevation acreage is limited. Those attributes unique to this association in higher elevations may be a critical element in the persistence of specific species in this habitat association. High elevation acreage is present within the proclamation boundary. Acquiring available land parcels will facilitate and increase management opportunities for these high elevation communities.*

References:

SAMAB, Southern Appalachian Man and the Biosphere. 1996. The Southern Appalachian Assessment Terrestrial Technical Report. Report 5 of 5. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta, GA.

USDA Forest Service, 1992. Southern Region. Silvicultural examination and prescription field book. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA.

USDA Forest Service. 1996. Landtype association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.

USDA Forest Service. 1997. Guidance for conserving and restoring old-growth forest communities on National Forests in the Southern Region. Report of the Region 8 Old-Growth Team. Forestry Report R8-FR 62. Atlanta, GA. 117p.

USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

USDA Forest Service. 1998. Continuous Inventory of Stand Condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

Attachment A.

Species List: Conifer-Northern Hardwood Habitat Association

Class	Common Name /Species
ANIMALS	
Amphibians	Mountain Dusky Salamander/ <i>Desmognathus ochrophaeus</i>
Birds	Sharp-shinned Hawk/ <i>Accipiter striatus</i> Blackburnian Warbler/ <i>Dendroica fusca</i> Wood Thrush/ <i>Hylocichla mustelina</i> Swainson's Warbler/ <i>Limnothlypis swainsonii</i> Red-breasted Nuthatch/ <i>Sitta canadensis</i>
Mammals	Kentucky Red-backed Vole/ <i>Clethrionomys gapperi maurus</i> Cloudland Deermouse/ <i>Peromyscus maniculatus nubiterrae</i> Masked Shrew/ <i>Sorex cinereus cinereus</i> Long-tailed Shrew/ <i>Sorex dispar blitchi</i> Appalachian Cottontail/ <i>Sylvilagus obscurus</i>
PLANTS	
Dicots	Small Enchanter's-nightshade/ <i>Circaea alpina ssp. alpina</i>
Liverworts	Liverwort/ <i>Nowellia curvifolia</i>
Monocots	Spotted Coralroot/ <i>Corallorhiza maculata</i> Wild Lily-of-the-valley/ <i>Maianthemum canadense</i>
Mosses	Fern Moss or Log Moss/ <i>Thuidium delicatulum</i>

Attachment B.

Conifer-Northern Hardwood Species/Habitat Relationships with References

ANIMALS

Amphibians

Mountain Dusky Salamander – *Desmognathus ochrophaeus* – This species has the broadest altitudinal distribution of any desmognathine salamander, reaching the highest elevations in the eastern United States. These salamanders become more terrestrial at higher elevations, apparently in response to increased humidity (Hairston, 1949; Tilley, 1973). At high elevations, the mountain dusky salamander prefers cool, moist floors of conifer forests (USGS, 2001); at low elevations, this species occurs primarily under rocks, logs or leaves near stream margins, springs, or seepage areas, where the ground is water saturated. Adults will often move far into the adjacent woodlands, particularly during rains. The mountain dusky salamander requires mesic woodlands, usually hardwoods or mixed pine-hardwood, with springs, seeps or rocky streams. In winter, this salamander is known to congregate in springs or seepage areas (USGS, 2001). Wet, mossy, rock faces are preferred by this species. The mountain dusky salamander's diet includes small arthropods and earthworms (Wilson, 1995)

Birds

Sharp-shinned Hawk – *Accipiter striatus* – During the year, sharp-shinned hawks utilize both hardwoods and conifers and, in general, are most abundant in areas where a mixture of tree types exists. Although they are known to nest in hardwoods, birds in Kentucky seem to prefer evergreens for nesting and over-wintering. The typical nesting site is in the canopy of a large, mature pine or hemlock within an extensive tract of forest. Sharp-shinned hawks are also observed (e.g., when foraging) within areas having a mix of forested and semi-open habitat; however, they more frequently occupy heavily forested areas (Hamel, 1992). Thus, year-round, the existence of tracts of mature forest is of prime importance to the species. Sharp-shinned hawks would be expected to occur in this habitat association primarily because of the presence of evergreen conifers that seem to be preferred by this species for nesting. On the DBNF, two nests have been reported, both from conifers (yellow pine and eastern hemlock) (L. Perry, pers. obsv).

Blackburnian Warbler – *Dendroica fusca* – This is a forest interior species of higher elevations, with most of the birds that are recorded in the Cumberland and Southern Appalachians occurring above 3500 feet (Hamel, 1992). A variety of coniferous and mixed forest types are utilized, with deciduous habitat being used to a greater extent in this southern part of the breeding range (DeGraaf et. al., 1991). Extensive tracts of mature forest, with large (> 20"dbh) nesting trees, are required (Hamel, 1992). The blackburnian warbler has a slight preference for forests of hardwoods mixed with hemlocks, spruce and fir (Hamel 1992). This habitat association would represent areas that provide this environment. On the DBNF, this species has only been encountered during periods of migration and would not be expected to breed on the DBNF except in areas where elevations are greater than 3500', of which there are few of.

Wood Thrush – *Hylocichla mustelina* – The wood thrush is found in a wide variety of forest types, provided a well-developed understory is present. Moderately shaded, deciduous and mixed stands of mature trees with a dense shrub and/or sapling understory are typical habitat, particularly when occurring on moist sites. The species frequently occurs in riparian habitat, rich hardwood and bottomland forests being favored; however, drier sites may be used, so long they have the relatively dense shrub layer. Nesting is in shrubs, vines, and small trees. Although the species will tolerate some fragmentation of habitat, it is most common in extensive forest and requires a minimum tract size of 3 hectares (Hamel 1992). This habitat association would be expected to attract nesting and foraging wood thrushes primarily due to the presence of hardwoods when combined with shaded and moist conditions.

Swainson's Warbler – *Limnithlypis swainsonii* – This forest interior species is found within tracts of moist, extensive forest that have dense understory (Palmer-Ball, 1996). Hemlock ravines, having dense growths of rhododendron and laurel, and bottomland forest, with a well-developed understory and/or thickets of small trees, are favored locations. Dense cane breaks are also used. On the DBNF, this bird is often observed in damp, shady hemlock ravines with an understory of rhododendron, near small streams (L.Perry, pers. obs.). Assuming water is nearby, this habitat association would be expected to attract Swainson's warblers primarily due to the shaded and moist conditions usually present in stands of mixed conifers and hardwoods.

Red-breasted Nuthatch – *Sitta canadensis* – Though this nuthatch is dependent on coniferous habitat, its requirements vary considerably between seasons. It generally breeds at elevations above 3500 feet, in dead spruce or fir trees. Occasionally it will nest in hemlock and, rarely, in pine (Hamel, 1992). Suitable snags (dead trees) are greater than 6" dbh (six inch diameter at breast height). Mature stands are favored. The red-breasted nuthatch prefers to over-winter in dense stands of conifers and pine-oak. During that time, the birds are not particular to age class so much as to stand density. On the DBNF, when these birds are encountered in winter, it is almost always while feeding in pines—especially mature Virginia Pines having a lot of cones. Breeding records of this species have only been reported from one site on the DBNF, which is a conifer-dominated stand composed of mature white pines and hemlock and less mature deciduous hardwoods (L. Perry, pers. obs.). This habitat association would be expected to attract foraging red-breasted nuthatches primarily due to the presence of conifers.

Mammals

Kentucky Red-backed Vole – *Clethrionomys gapperi maurus* – The Kentucky red-backed vole is known to inhabit the higher elevations of the conifer-northern hardwood forest type on the Redbird Ranger District, DBNF. It is found in dense forest habitat, cool damp woodlands with down logs, and shaded rock talus areas usually on north facing slopes. Moss covered rocks are a common occurrence in this species favored habitat. The red-backed vole feeds on a variety of nuts, seeds berries, bark and roots. Its distribution is likely to be controlled, in part, on the availability of free water because this vole is known to drink large quantities.

Cloudland Deermouse – *Peromyscus maniculatus nubiterrae* – This species is known from cool moist forests at higher elevations in the Black Mountain area of the DBNF. This nocturnal species occurs in both the conifer-northern hardwood and mixed mesophytic forest types with minimum edge. In these areas it is sometimes associated with talus or rock outcrops. Fallen logs,

typical of older growth forest conditions are important components of their habitat. Food habits are about 50 percent insects with fruit and vegetation utilized in the spring and summer and seeds and nuts utilized in the fall and winter.

Masked Shrew – *Sorex cinereus cinereus* – The masked shrew is associated with higher elevations of the conifer-northern hardwood habitat association. They are found in deep, moist woodlands and prefer areas of thick leaf mold and decaying fallen logs. Masked shrews may occur in small populations on the Redbird Ranger District, DBNF. The species may occur in other forested habitats, particularly near stream head seeps, that have the right conditions to support numerous invertebrate food species and moisture conditions. The dens of masked shrews are located in cavities in logs or snags, under logs or in shallow burrows. In streamside areas they may be found in communities dominated by hemlock/rhododendron. The diet of this species consists of a variety of invertebrates and small vertebrate animals. They prefer moist habitats and access to free water may be important.

Long-tailed Shrew – *Sorex dispar blitchi* – The long-tailed shrew is found in the higher elevations of the conifer-northern hardwood forest habitat association on the Redbird Ranger District, DBNF. There the species is found among cool, moist or shady boulder fields or talus slopes often moss covered. The species also has been found near headwater seeps in mature forest areas in this habitat association. Food habits consist of a wide variety of invertebrates associated with mature forest communities. Nest sites are usually associated with natural subterranean tunnels among boulder crevices.

Appalachian Cottontail Rabbit – *Sylvilagus obscurus* - This forest dwelling species occurs on the DBNF in areas ranging from conifer-northern hardwood to mixed mesophytic to dry-mesic oak forest. It is regarded as a forest interior species susceptible to habitat fragmentation. It prefers relatively cool, understory areas of ericaceous vegetation such as mountain laurel, rhododendron and blueberries. Large tracts of contiguous, relatively old forest overstory vegetation are needed to provide viable populations of this species.

PLANTS

Dicots

Small Enchanter's-nightshade – *Circaea alpina ssp. alpina* – This is a northern species with a range extending southward along the Appalachian Mountains. It requires cool, moist conditions. On the DBNF, it is found associated with cold air drainage and narrow sandstone hollows with high shade and humidity. Almost always it is near a stream, but usually out of the floodplain.

Liverworts

Liverwort – *Nowellia curvifolia* – This liverwort is widespread in northern North America, south into the Appalachian provinces, present in the high mountains of Mexico and Central America. It is found almost exclusively on decorticated logs. On the DBNF, it is found almost exclusively on decorticated eastern hemlock and yellow pine logs, usually of 10-12 inch diameter or larger. It requires moderate to heavy shade.

Monocots

Spotted Coralroot – *Corallorhiza maculata* – The spotted coralroot is mostly a northern species with extensions into the Appalachian Mountains. Its habitat is hardwood forest, but occurs under a variety of conditions. In Kentucky, it is known only from Pine Mountain within the DBNF proclamation boundary. It occurs on dry-mesic oak-hardwood forest in rich soil.

Wild Lily-of-the-valley – *Maianthemum canadense* – This is a northern North American species with range extensions south along the Appalachian Mountains. It is found in acid, well-drained sites under eastern hemlock and mixed hardwood forest. It is commonly found on rotten logs or hummocks in wet woods. On the DBNF, it is found on lower slopes and upper terraces in eastern hemlock or mixed mesophytic forest. These sites are cool and shady.

Mosses

Fern Moss or Log Moss – *Thuidium delicatulum* – This moss is a northern US and Canadian species which extends southward in the eastern US to the Gulf coast (and south to northern South America). It is a usually common species in its habitat, which is on moist soil, humus, rocks, or logs in forest or sometimes meadows or fields. On the DBNF, it is most common in mixed mesophytic forest on rocks, logs and soil, but is also found in dry-mesic forest, and rarely in xeric forest. It also occurs on the DBNF in old fields and meadows, sometimes ruderal areas. This species is widely collected for the horticultural industry and in some areas is becoming scarce.

References:

- DeGraaf, R.M., V.E. Scott, R.H. Hamel, L. Ernst, and S.H. Anderson. 1991. Forest and Rangeland birds of the United States - Natural History and Habitat Use. USDA Agriculture Handbook 688. 625 pp.
- Hairston, N.G. 1949. The local distribution and ecology of the plethodontid salamanders of the southern Appalachians. Ecol. Monogr. 19:47-73.
- Hamel, Paul B. 1992. Land manager's guide to birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Mengel, R.M. 1965. The birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581pp.
- Palmer-Ball, B.L. 1996. The Kentucky breeding bird atlas. The University Press of Kentucky, Lexington, KY. 372pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.
- Tilley, S.G. 1973. *Desmognathus ochrophaeus*. Cat. Amer. Amphib. Rept.: 129.1-29.4.

07/15/2003

USDI, U.S. Geological Survey, Northern Prairie Wildlife Research Center, Jamestown, ND. June 2001.

Wilson, Lawrence A. 1995. Land manager's guide to the Amphibians and Reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, North Carolina and The U.S. Forest Service, Southern Region, Atlanta, GA.

07/15/2003

Attachment C.

Conifer-Northern Hardwood Association Matrix

Association	Habitat	Modifier	Class	Common/Species
2-Conifer-N. Hdwd.	Conifer-Northern Hardwood Forest	Acidic Substrate	P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Cold Air Drainage	P-DIC	Small Enchanter's-nightshade/ Circaea alpina ssp. alpina
		Cool Temperatures	AMPHI	Mountain Dusky Salamander/ Desmognathus ochrophaeus
			P-DIC	Small Enchanter's-nightshade/ Circaea alpina ssp. alpina
			P-MON	Wild Lily-of-the-Valley/ Maianthemum canadense
		Dense shrub understory	BIRD	Wood Thrush/ Hylocichla mustelina
				Swainson's Warbler/ Limnothlypis swainsonii
		Downed Logs	MAMM	Kentucky Red-backed Vole/ Clethrionomys gapperi maurus
				Cloudland Deermouse/ Peromyscus maniculatus nubiterrae
				Masked Shrew/ Sorex cinereus cinereus
		Downed Logs (minimum size)	P-LIV	Liverwort/ Nowellia curvifolia
		Elevation (above 2300 ft)	BIRD	Blackburnian Warbler/ Dendroica fusca
				Red-breasted Nuthatch/ Sitta canadensis
		Ericaceous Shrub Associate	MAMM	Appalachian Cottontail/ Sylvilagus obscurus
		Forest Interior (Minimal Edge)	BIRD	Sharp-shinned Hawk/ Accipiter striatus
				Blackburnian Warbler/ Dendroica fusca
		Forest Interior (Minimal Edge)	BIRD	Swainson's Warbler/ Limnothlypis swainsonii
			MAMM	Appalachian Cottontail/ Sylvilagus obscurus
		High Shade	P-MON	Spotted Coralroot/ Corallorhiza maculata
				Wild Lily-of-the-Valley/ Maianthemum canadense
		Large Decadent Trees	BIRD	Sharp-shinned Hawk/ Accipiter striatus
		Mature forest		Sharp-shinned Hawk/ Accipiter striatus
				Blackburnian Warbler/ Dendroica fusca
				Wood Thrush/ Hylocichla mustelina
				Red-breasted Nuthatch/ Sitta canadensis
		Mid-age Forest		Wood Thrush/ Hylocichla mustelina
		Moderate Shade		Wood Thrush/ Hylocichla mustelina
			P-MON	Spotted Coralroot/ Corallorhiza maculata
			P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Moist	AMPHI	Mountain Dusky Salamander/ Desmognathus ochrophaeus
			BIRD	Wood Thrush/ Hylocichla mustelina
			MAMM	Cloudland Deermouse/ Peromyscus maniculatus nubiterrae
				Masked Shrew/ Sorex cinereus cinereus
			P-DIC	Small Enchanter's-nightshade/ Circaea alpina ssp. alpina

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
			P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Old Growth Condition	MAMM	Kentucky Red-backed Vole/ Clethrionomys gapperi maurus
				Cloudland Deermouse/ Peromyscus maniculatus nubiterrae
		Old Growth Condition	MAMM	Long-tailed Shrew/ Sorex dispar blitchi
		Riparian	MAMM	Long-tailed Shrew/ Sorex dispar blitchi
		Rocky/Rocks		Kentucky Red-backed Vole/ Clethrionomys gapperi maurus
				Long-tailed Shrew/ Sorex dispar blitchi
			P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Snags > 6" dbh		Red-breasted Nuthatch/ Sitta canadensis
		Tract Size (Area Sensitive)		Swainson's Warbler/ Limnolophus swainsonii
		Tree and Snags (Cavity Nesters)		Red-breasted Nuthatch/ Sitta canadensis
		Trees > 20" dbh		Blackburnian Warbler/ Dendroica fusca
		Water (Distance Sensitive)	MAMM	Kentucky Red-backed Vole/ Clethrionomys gapperi maurus
				Masked Shrew/ Sorex cinereus cinereus

**Viability Assessment Report
For
Mixed Mesophytic Forest Habitat Association**

Prepared by
Pamela J. Martin
Daniel Boone National Forest

I. Description of Habitat Association

Mixed mesophytic forests can be found primarily in the southern Appalachians. Mixed mesophytic forest sites tend to occur in lower north and east facing slopes and mesic coves up to an elevation of about 5,000 feet. Species dominance patterns vary with geographic location and site condition, such as topographic features, moisture and fertility (USDA Forest Service, 1997). Characteristic species in this habitat association are sugar maple, beech, hemlock, yellow-poplar, red maple, white oak, northern red oak, yellow buckeye and basswood (USDA Forest Service, 1997).

The Daniel Boone National Forest (DBNF) occurs in three ecological sections: Northern Cumberland Plateau, Interior Low Plateau and Highland Rim, Cumberland Mountains. Mixed mesophytic habitat occurs in all three of these ecological sections. The majority of the mixed mesophytic habitat on the DBNF occurs in the Northern Cumberland Plateau ecological section. In the Northern Cumberland Plateau, mixed mesophytic habitat occurs in the following landtype associations (LTAs) (see USDA Forest Service, 1997a; 1996):

- Northern Low Hills / Cliff Transition (221Hb005)
- Northern Escarpment (221Hb004)
- Central Knobstone Escarpment (221Hb001)
- North Fork Kentucky Cliffs (221Hb003)
- Central Cliff (221Hb002)
- Rolling Low Hills (221He001)
- London-Corbin Plain Transition (221HC007)
- Rockcastle Hills (221Hc005)
- London-Corbin Plain (221Hc006)
- Southern Cliff (221Hc003)

- Southern Knobstone Escarpment (221Hc001)
- Low Hills (221He002)
- Low Hills – Rugged Hills Transition (221Ha002)
- Southern Middle Breathitt Rugged Hills (221Ha001).

On the DBNF, Interior Low Plateau and Highland Rim, mixed mesophytic habitat occurs in the following LTAs (USDA Forest Service, 1997a; 1996):

- Triplett Creek Knobs (222En002)
- Knob Flats (222En001)
- Fox Creek Knobs (222En003).

In the Cumberland Mountain ecological section on the DBNF, mixed mesophytic habitat occurs in the following LTAs (USDA Forest Service, 1997a; 1996):

- Northern Jellico Mountains (M221Cd001),
- Northwest Face Pine Mountain (M221Ce001).

On the DBNF, this habitat association is concentrated on colluvial slopes, with some concentration on north facing aspects. Water on these sites is primarily from surface sources (rainfall). Occasionally, limited amounts of ground water help maintain the sites. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the mixed mesophytic habitat association, also provides energy sources. Typical soil series are Jefferson, Shelocta, Muse or Cranston, derived from sandstone, siltstone or shale. Some stands also occur on limestone covered by non-calcareous material on colluvial benches or alluvial terraces.

This is a complex type of habitat association on mixed sandstone and limestone talus (e.g. on Donahue soils), which beech, yellow-poplar and a mixture of Eastern hemlock, sugar maple and hardwood species can be observed. On both sandstone and limestone, American beech is particularly abundant on lower slopes and terraces near rivers and major creeks. Disturbance appears to have converted most beech forest to yellow-poplar or, especially on eroded soils, oak-hickory and pine (USDA Forest Service et al., 1989). In addition to the dominant tree species, cucumber tree, white basswood and butternut occur in this habitat association. In the transition to oak/hickory, there are few shrubs, except near streams. Ironwood, papaw, spicebush, wild hydrangea, strawberry bush, and blackhaw are relatively frequent. There is a rich herbaceous layer in this habitat association. Abundant species include yellow trout lily, large flowered trillium, May apple, long spurred violet, and white wood aster. In younger stands, hog peanut is often present. Other species that can be observed, especially on floodplains and in burnt areas, are black cohosh, Virginia creeper, and Christmas fern. Other frequent species include maidenhair fern, silvery gladefern, marginal woodfern, rue

anemone, wild geranium, wood vetch, white baneberry, goat's beard, alum root, sweet anise, short Joe-Pye weed, thin leaved sunflower, large leaf aster and yellow lady's slipper. Species that can be observed in habitat transition zones are wild ginger, hepatica, stonecrop and white snakeroot. Typical floodplain species are also locally abundant, especially on seeping talus slopes; these include wood nettle, pale jewelweed, bergamot, dog violet and in disturbed areas, golden ragwort can be observed. Sandstone rockhouses occur adjacent to beech forest or related types; the unique habitat beneath overhanging sandstone cliffs and rockhouses often occurs within or adjacent to hemlock forest. Frequent species include alum-root on drier sites and cliff meadow rue or little cliff meadow rue on wetter sites. Mountain spleenwort can be observed in cliff cracks. In this habitat association, columbine and round leaved catchfly occurs under both sandstone and limestone cliffs (USDA Forest Service et al., 1989).

II. Current Status of the Habitat Association on the Daniel Boone National Forest.

The mixed mesophytic forest types on the DBNF as tracked in the Continuous Inventory of Stand Conditions (CISC), include cove hardwood/ white pine/ hemlock (41), yellow-poplar (50), yellow-poplar/ white oak and northern red oak (56) and sugar maple/ beech/ birch (81). The management codes in the mixed mesophytic habitat group, are defined as follows:

(41) – Of the dominant and co-dominant basal area 50 to 69 percent is cove hardwood, and 30-49 percent is conifer, the plurality of which is hemlock and/or white pine;

(50) – Of the dominant and co-dominant basal area, 70+ percent is hardwood and at least 50 percent is yellow-poplar;

(56) – Of the dominant and co-dominant basal area, 70+ percent is hardwood, and at least 50 percent is cove hardwood; and

(81) – Of the dominant and co-dominant basal area 70 percent is hardwood, and at least 50 percent is sugar maple and/or American beech (USDA Forest Service, 1992).

On the DBNF, approximately 665,000 acres are in forested land. Of this acreage, approximately 25 percent or 165,474 acres are within the mixed mesophytic forest type, as described. Utilizing the CISC database, the mixed mesophytic forest type on the DBNF was further divided to show distribution of this habitat association by age and acres (USDA Forest Service, 1998).

Table 1. Forest types within the Mixed Mesophytic Habitat Association by age and acres.

AGE	Cove Hardwood / White Pine / Hemlock (41)	Yellow Poplar (50)	Yellow Poplar / White Oak / Northern Red Oak (56)	Sugar Maple / Beech / Birch (81)
0-10	164	225	10898	459
11-20	57	262	7625	225
21-30	340	855	11071	209

AGE	Cove Hardwood / White Pine / Hemlock (41)	Yellow Poplar (50)	Yellow Poplar / White Oak / Northern Red Oak (56)	Sugar Maple / Beech / Birch (81)
31-40	215	1869	9663	445
41-50	286	2892	11541	272
51-60	119	2019	13400	82
61-70	801	1415	20310	265
71-80	719	776	19425	712
81-90	1853	652	15770	1343
91-100	1327	134	10374	1717
101-110	1060	96	5412	1088
111-120	490	0	1252	995
121-130	189	0	797	225
131-140	129	0	0	46
141-150+	427	0	360	122
TOTAL	8176	11195	137898	8205

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The desired future condition for this habitat association would be to provide amounts of suitable habitat in the proper stages of succession to ensure that the species dependant on the association have a high probability of persistence on the forest. This would involve maintaining a structured age class distribution with emphasis on maintaining a significant component of habitat that contains the habitat modifiers required by various species.

- Evaluate habitats to determine those capable of supporting reintroduction of species at risk.
 - *Rationale: Specific species management within this habitat association may require reintroduction efforts to ensure continued persistence of that particular species or group of species in this association.*
- Mixed mesophytic forest types need to be represented in a range of age classes.
 - *Rationale: Mixed mesophytic forest types make up approximately 25 percent of the forest types on the Daniel Boone National Forest. The species identified in this habitat association require a variety of age classes, elevations and tract sizes. A range of age classes, along with their accompanying attributes, is a necessary component of this habitat association. Age distribution management along with implementation of best management practices should ensure continued persistence of the species identified in this habitat association.*
- Where applicable, leave project unit boundaries with irregular and feathered edges.

- *Rationale: Abrupt habitat changes can create barriers to wildlife passing through the unit.*
- Put an emphasis on high elevation management and land acquisitions for the forest.
 - *Rationale: Many species require the conditions provided for in higher elevations. Current national forest system lands on the Daniel Boone National Forest has limited high elevation habitat. However, high elevation acreage is present within the proclamation boundary.*
- Water sources should be maintained in a condition where they are suitable as water sources for bats and other wildlife, and as breeding habitat for resident amphibians and invertebrates (DBNF LRMP, Amendment 11, pg 7).
 - *Rationale: Some species in this association are closely linked to proximity of water. The continued existence of local water sources should help to ensure the continued persistence of those species in this habitat association.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

Monitoring and inventory of the Mixed Mesophytic Habitat Association will need to be implemented at a level sufficient to provide data to track the current condition of the habitat. The following items are considered necessary to ensure that the association can be properly evaluated and decisions supported.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 years. Stand (or analysis unit) inventory should also be conducted in response to events that have potential to alter the landscape i.e., windstorms, winter storms, and infestations (high priority).
 - *Rationale: Inventory to identify and update baseline data or assess changed conditions after non-prescribed major disturbances. Inventory may be at the stand level or larger units may be used (such as ecological or habitat units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*
- Employ GIS and vegetation management databases to track the condition and composition of the Mixed Mesophytic Habitat Association (high priority).
 - *Rationale: The use of FS Veg (CISC or best available science) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the pine habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers.*
- Continue to implement R8 landbird monitoring program (high priority).

- *Rationale: This monitoring program will help track the persistence of the avian species in this habitat association. This may be a critical element in documenting avian species trends in this association. This monitoring program contains points linked to this association it would be considered an excellent tool for both species-specific and association monitoring.*

References

- USDA Forest Service. 1992. Southern Region. Silvicultural Examination and Prescription Field Book.
- USDA Forest Service. 1996. Landtype association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1997. Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region. Report of the Region 8 Old-Growth Team. Forestry Report R8-FR 62. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta, GA. 117p.
- USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 1998. Continuous Inventory of Stand Condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest, Winchester, KY.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1989. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stanton Ranger District. Winchester, KY. 316 pp.

Attachment A.

Species List: Mixed Mesophytic Habitat Association

Class	Common Name/ Species
ANIMALS	
Amphibians	Jefferson Salamander/ <i>Ambystoma jeffersonianum</i>
Birds	Cerulean Warbler/ <i>Dendroica caerulea</i> Least Flycatcher/ <i>Empidonax minimus</i> Acadian Flycatcher/ <i>Empidonax virescens</i> Worm-eating Warbler/ <i>Helmitheros vermivorus</i> Wood Thrush/ <i>Hylocichla mustelina</i> Swainson's Warbler/ <i>Limnothlypis swainsonii</i> Kentucky Warbler/ <i>Oporornis formosus</i> Ovenbird/ <i>Seiurus aurocapillus</i> American Redstart/ <i>Setophaga ruticilla</i> Yellow-throated Vireo/ <i>Vireo flavifrons</i>
Insects	Sixbanded Longhorn Beetle/ <i>Dryobius sexnotatus</i> Diana Fritillary/ <i>Speyeria diana</i>
Mammals	Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii</i> Virginia Big-eared Bat/ <i>Corynorhinus (Plecotus) townsendii virginianus</i> Cloudland Deermouse/ <i>Peromyscus maniculatus nubiterrae</i> Appalachian Cottontail/ <i>Sylvilagus obscurus</i>
Reptiles	Northern Coal Skink/ <i>Eumeces antracinus antracinus</i> Southeastern Crowned Snake/ <i>Tantilla coronata</i>
PLANTS	
Dicots	Monkshood/ <i>Aconitum uncinatum</i> (generic) Blue Monkshood/ <i>Aconitum uncinatum</i> spp. <i>uncinatum</i> Carolina Allspice or Sweetshrub/ <i>Calycanthus floridus</i> Carolina Allspice or Sweetshrub/ <i>Calycanthus floridus</i> var. <i>glaucus</i> Green-and-gold/ <i>Chrysogonum virginianum</i> var. <i>virginianum</i> Mountain Black Cohosh/ <i>Cimicifuga americana</i> Black Cohosh/ <i>Cimicifuga racemosa</i> Small Enchanter's-nightshade/ <i>Circaea alpina</i> ssp. <i>alpina</i> Beech Drops/ <i>Epifagus virginiana</i> Southern Heartleaf/ <i>Hexastylis contracta</i> Goldenseal/ <i>Hydrastis canadensis</i> Butternut/ <i>Juglans cinerea</i>

Class	Common Name/ Species
Dicots	Smooth Veiny Peavine/ <i>Lathyrus venosus</i> American Gromwell/ <i>Lithospermum latifolium</i> Carolina Anglepod/ <i>Matelea carolinensis</i> Ginseng/ <i>Panax quinquefolius</i> Sanicle/ <i>Sanicula canadensis</i> Bay Starvine/ <i>Schisandra glabra</i> Southern Oconee Bells/ <i>Shortia galacifolia</i> var. <i>galacifolia</i> Wasioto Rosinweed/ <i>Silphium wasiotense</i> Big-flowered Snowbell/ <i>Styrax grandiflorus</i> Northern Mayflower/ <i>Trientalis borealis</i> Running Buffalo Clover/ <i>Trifolium stoloniferum</i>
Gymnosperms	Canada Yew/ <i>Taxus canadensis</i>
Monocots	Purple Caric Sedge/ <i>Carex purpurifera</i> Spotted Coralroot/ <i>Corallorhiza maculata</i> Small Yellow Lady's-slipper/ <i>Cypripedium parviflorum</i> var. <i>parviflorum</i> Loesel's Twayblade/ <i>Liparis loeselii</i> Wild Lily-of-the-valley/ <i>Maianthemum canadense</i> Small-flowered False Hellebore/ <i>Melanthium parviflorum</i> White Fringeless Orchid/ <i>Platanthera integrilabia</i> Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
Mosses	Feather Moss or Log Moss / <i>Hypnum curvifolium</i> Feather Moss or Log Moss / <i>Hypnum imponens</i> Fern Moss or Log Moss / <i>Thuidium delicatulum</i>

Attachment B.

Mixed Mesophytic Species/Habitat Relationships with References

ANIMALS

Amphibians

Jefferson Salamander – *Ambystoma jeffersonianum* – Jefferson salamander is found primarily in shady deciduous forests or mixed woods, low woods and bottomlands. This salamander requires abundant leaf litter, rocks, decomposing logs and stumps. During breeding season, the Jefferson salamander requires temporary ponds, ideally with a pH between 5 and 6 (DeGraff and Rudis, 1986). This salamander is an opportunistic feeder consuming small invertebrates (Wilson, 1995).

Birds

Cerulean Warbler – *Dendroica caerulea* – Cerulean warblers depend primarily on extensive tracts of mature, relatively undisturbed, deciduous forest. These birds occur in floodplains and upland sites that have large trees (> 20" dbh) in which to nest. Both nesting and foraging take place in the canopies of hardwoods. Stands are usually somewhat open, with little understory; however, according to Buehler and Nicholson, monitoring data suggest that breeding territories in the Cumberland Mountains tend to have fewer canopy trees and greater shrub coverage than those elsewhere. The birds are rarely found in tracts less than 250 hectares, whereas maximum population densities occur in tracts greater than 3000 ha (1997). Hamel gives a minimum tracts size of 1750 ha (1992). Cerulean warblers would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory.

Least Flycatcher – *Empidonax minimus* – This is a species of open conditions; it is rarely encountered deep in the forest. Open, deciduous woods (particularly those that have been disturbed by burning or logging), forest edge, fields with scattered large trees, and other habitats that provide early successional conditions are utilized. During spring migration, Mengel observed male birds in alders and willows in a marshy, Laurel County meadow (1965). Most of the breeding population frequents elevations above 2500 feet. This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory.

Acadian Flycatcher – *Empidonax virescens* – This species is usually found near water generally near a stream course or some small waterway (Hamel, 1992). It generally uses an open, moderate understory for feeding in a stand with tall trees and closed canopy (DeGraaf et. al., 1991). It is associated with forested tracts at least 37 hectares (91.4 acres) in size (Hamel, 1992). DBNF monitoring data indicates that the greatest number of occurrences for this species were in mesophytic-cove habitats greater than 80 years old. Acadian flycatchers would be expected to be attracted to the shaded, moist coves of the mixed mesophytic forest where these coves are adjacent to streams.

Worm-eating Warbler – *Helmitheros vermivorus* – Worm-eating warblers inhabit moist, shady forest on moderate to steep slopes. In eastern KY, the birds are common on deeply shaded slopes

in mixed mesophytic woods and moist ravines (Mengel 1965). They are usually found in fairly mature deciduous or mixed forest with a dense understory, preferably of rhododendron and mountain laurel, but will also use younger forest and forest edge. Nesting is typically on sloping ground among leaf litter, while foraging is carried out on the ground or among understory vegetation. Although the species occurs in dissected woodland, it avoids isolated tracts (Palmer-Ball, 1996). Hamel lists the minimum necessary tract size as 370 ha (1992). This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory combined with damp, shaded conditions.

Wood Thrush – *Hylocichla mustelina* – The wood thrush is found in a wide variety of forest types, provided a well-developed understory is present. Moderately shaded, deciduous and mixed stands of mature trees with a dense shrub and/or sapling understory are typical habitat, particularly when occurring on moist sites. Rich hardwood and bottomland forests are favored; however, drier sites may be used, so long they have the relatively dense shrub layer. Nesting is in shrubs, vines, and small trees. Although the species will tolerate some fragmentation of habitat, it is most common in extensive forest and requires a minimum tract size of 3 hectares (Hamel 1992). This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory combined with damp, shaded conditions.

Swainson's Warbler – *Limnethlypis swainsonii* – This forest interior species is found within tracts of moist, extensive forest that have dense understory. Hemlock ravines, having dense growths of rhododendron and laurel, and bottomland forest, with a well-developed understory and/or thickets of small trees, are favored locations. Dense cane breaks are also used. On the DBNF, this bird is often observed in damp, shady hemlock ravines with an understory of rhododendron, near small streams (L.Perry, pers. obs.). Swainson's warblers would be expected to be attracted to the shaded, moist coves of the mixed mesophytic forest where these coves are adjacent to streams.

Kentucky Warbler – *Oporornis formosus* – Kentucky warblers are most frequent in moist, shady, deciduous and mixed (with pine or hemlock) forest types with dense, shrubby understory. However, in eastern KY they occur in virtually all major associations except the most xeric pine and pine-oak communities, and may even invade them (Mengel 1965). Mature stands are required, though some younger stands and shrubby woodland borders are used, as well. These ground-nesting birds forage in understory vegetation, leaf litter, and soil. By providing a well-developed shrub layer, many tracts disturbed by selective logging are suitable for nesting even though the canopy has been disrupted (Palmer-Ball, 1996). In general, these birds have adjusted better to landscape disturbance than other woodland warblers. This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory and understory combined with damp, shaded conditions that are usually present in the mixed mesophytic forest.

Ovenbird – *Seiurus aurocapillus* – Mature and second growth forest conditions are utilized, on dry to moderately moist sites with light to moderate understory. Birds are more common in stands with closed canopies and open ground—This is a ground nesting species that forages in the leaf litter or on the soil. Mengel observed nests on logging roads and under small logs, sheltered by ferns, on steep, mesophytic slopes (1965); however, Baker and Lacki note that birds are more abundant in non-harvested than in harvested areas (1997). Upland stands and sloping

terrain are preferred, but a variety of deciduous and mixed (e.g., pine-oak) forest types are used. This is a forest interior species having a minimum necessary tract size of 15 ha (Hamel 1992). This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory that provides leaf litter for nesting, foraging, and cover.

American Redstart – *Setophaga ruticilla* – This species typically utilizes younger forest and forest in early to mid stages of succession (Palmer-Ball, 1996). It usually occurs near water or streams preferring moist situations to dry ones (Barbour et. al., 1973)(Hamel, 1992). Occurs in altered forest situations including selectively logged areas (Palmer-Ball, 1996). DBNF monitoring data indicates this species most common in forests 41 to 80 years old. This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory combined with damp, mesic conditions.

Yellow-throated Vireo – *Vireo flavifrons* – Extensive tracts of relatively mature woodland are necessary for this interior breeding bird. Large, deciduous trees within a variety of forest types, including mixed mesophytic cove, pine-oak, and oak hickory upland forest, are favored. Isolated or much-dissected tracts are avoided; however, the bird will tolerate a certain amount of disturbance (from fire, selective logging) without being dramatically affected (Palmer-Ball, 1996). Rather, activities that serve to result in a fairly open midstory/understory can be beneficial, as the bird frequents trees within relatively open settings. Yellow-throated vireos on the DBNF are often observed in hardwoods within mixed pine-hardwood stands that have been burned or had midstory reduction (L.Perry, pers. obs.). This species would be expected to occur in the mixed mesophytic forest primarily because of its deciduous hardwood forest overstory.

Insects

Sixbanded Longhorn Beetle – *Dryobius sexnotatus* – The only occurrences are known from the Stanton Ranger District of the Daniel Boone, but it may occur in suitable habitat forest-wide. This insect requires large decadent trees, usually beech and sugar maples, for its larval stage.

Diana Fritillary – *Speyeria diana* – On the Daniel Boone, it is found in open areas and within the forest especially those that are open and well-lit. These conditions mimic open prairies and pine barrens from which the species is known out west and may be found along grassland/forest edge or in forests that have been maintained in an open condition by repeated fires. The caterpillar feeds almost exclusively on violets and over-winter above ground making them sensitive to spring and fall fires. Midstory removal and prescribed fire can create high quality foraging habitat for adults by increasing nectar sources. A variety of species are used, including common and swamp milkweeds, ironweed, red clover, coneflowers and butterfly bush. Individuals will use small openings and roadsides along forest edges in search of nectar plants, but do not go far from the woods.

Mammals

Rafinesque's Big-eared Bat – *Corynorhinus (Plecotus) rafinesquii rafinesquii* – The Rafinesque big-eared bat is a year-round resident throughout the DBNF. During the summer it forages in a variety of forested habitats and in forest edges and open areas. During the day it will roost in limestone and sandstone rockhouses and caves, in hollow trees and under exfoliating bark.

During the summer males tend to be solitary roosters while females form maternity colonies. Several maternity colonies, usually associated with cliffline caves and rockhouses, occur on the forest. This species is insectivorous and feeds primarily on moths. Foraging sites often occur along clifflines or ridgelines in an oak-hickory habitat. Cliffline associated rock shelters are used as feeding sites. Clifflines are also thought to provide travel corridors for the Rafinesque's big-eared bat. During the summer this species normally forages within about one mile of the roost site. Hibernation sites occur mainly in caves, but some sites occur in rockshelters and in large cracks in sandstone cliffline. This species is very sensitive to human disturbance of both its hibernation and maternity colony sites.

Virginia Big-eared Bat – *Corynorhinus (Plecotus) townsendii virginianus* – The Virginia big-eared bat is a year-round resident on the northern half of the DBNF. Foraging habitat occurs in many different forest overstory types, but is commonly associated with sandstone and limestone clifflines and ridgetops. This species also forages over grassy forest openings (old fields) and along forest edge. Forest openings may provide uncluttered foraging space where preferred prey species occur and can be more easily captured. Sandstone rockshelters and small caves are utilized as temporary feeding roosts. In the summer female and young Virginia big-eared bats form nursery colonies while males are ordinarily solitary although some bachelor colonies do occur. Maternity colonies usually roost near the entrance of rockshelters or caves at the edge of the light zone. Thus, they are very susceptible to human disturbance. Food habits consist primarily of small moths, but also include butterflies, flies and beetles. Forest canopy around roost sites may provide important protection from potential predators such as owls. Virginia big-eared bats hibernate in large clusters in a few limestone caves on the DBNF. As in the summer, they are highly susceptible to human disturbance and may abandon a colony site after repeated human intrusion. Maintaining stable microhabitat conditions and forested communities around the maternity and hibernation caves is important to maintaining these sites.

Cloudland Deermouse – *Peromyscus maniculatus nubiterrae* – The cloudland deermouse is known from cool moist forests at higher elevations in the Black Mountain area of the DBNF. This nocturnal species occurs in both the conifer-northern hardwood and mixed mesophytic forest types with minimum edge. In these areas it is sometimes associated with talus or rock outcrops. Fallen logs, typical of older growth forest conditions are important components of their habitat. Food habits are about 50 percent insects with fruit and vegetation utilized in the spring and summer and seeds and nuts utilized in the fall and winter.

Appalachian Cottontail – *Sylvilagus obscurus* – The Appalachian cottontail rabbit is a forest dwelling species that occurs on the DBNF in areas ranging from conifer-northern hardwood to mixed mesophytic to dry-mesic oak forest. It is regarded as a forest interior species susceptible to habitat fragmentation. It prefers relatively cool, understory areas of ericaceous vegetation such as mountain laurel, rhododendron and blueberries. Large tracts of contiguous, relatively old forest overstory vegetation are needed to provide viable populations of this species.

Reptiles

Northern Coal Skink – *Eumeces anthracinus anthracinus* – The Appalachian population of this subspecies extends into eastern KY, while a disjunct population occurs in the west-central part of the State. Suitable habitat includes damp forests of oak, oak-poplar, oak-hickory-pine, and mixed

pine-hardwood with moist soils, abundant leaf litter, logs, and/or loose stones; humid wooded or rocky hillsides; rocky bluffs; and similar areas near water sources, such as streams, springs, swamps, and bogs. These skinks seek the cover of rocks, logs, stumps, brush, and rock slabs. When pursued, they will take refuge in shallow water, hiding under rocks at the bottom. Various rocky areas in which they have been found include: on limestone ledges; in dry leaves beneath rock ledges; beneath flat slabs of sandstone; under rocks in sunlit forest openings and in grassy cut over areas in hardwoods; and under rocks in the slope of a road cut through a mixed forest (VA Dept. of Game and Inland Fisheries 2001). Use of fire to maintain grassy openings within forested stands is of benefit to this species. Coal Skinks feed primarily on insects and spiders.

Southeastern Crowned Snake – *Tantilla coronata* – The southeastern crowned snake ranges from south-central Virginia and southern Illinois to the Florida panhandle and eastern Louisiana. This secretive snake is an excellent burrower, spending much of its time concealed in rotting logs, under bark, stones, leaf litter, pine needles, or burrowed in the soil. The southeastern crowned snake apparently prefers relatively xeric, well-drained soils in pine flatwoods, sandhills and dry hillsides. This snake requires dry habitats with friable soil and sufficient debris for shelter. Females deposit eggs in rotting logs or sawdust piles. The southeastern crowned snake's diet consists of centipedes, spiders, termites, and other small, soft-bodied arthropods. (Wilson, 1995).

PLANTS

Dicots

Monkshood - *Aconitum uncinatum* (generic) – The Monkshood occurs on the DBNF and belongs to the subspecies *uncinatum*. See the description for this taxon below.

Blue Monkshood – *Aconitum uncinatum* ssp. *uncinatum* – The blue monkshood is a northern species that requires cool temperatures. On the DBNF, the species is restricted to mesic hardwood forest in sandy soil near streams. Most locations are at the southern end of the forest, but one is more northern.

Carolina Allspice or Sweetshrub – *Calycanthus floridus* (generic) – The Carolina Allspice or Sweetshrub occurs as var. *glaucus* on the DBNF. Species-habitat relationships are described for that variety below.

Carolina Allspice or Sweetshrub – *Calycanthus floridus* var. *glaucus* – This plant is a southern species found in a variety of habitats, but usually along waterways. It often grows in large colonies. On the DBNF is found on stream terraces which are well-drained and seldom subject to flooding. The overstory is usually open and composed of mixed oak-hardwoods, sometimes with southern yellow pine. One site occurs on the upper portions of a toe slope in oak forest.

Green-and-gold – *Chrysogonum virginianum* var. *virginianum* – Green-and-gold is a species of the eastern US that is found in forests with sandy soils, often on river terraces. On the DBNF, it is found along streams in sandy terrace forest. The habitat is seldom subject to flooding.

Mountain Black Cohosh – *Cimicifuga americana* – Mountain Black Cohosh is an Appalachian Mountain species, found in mesic cove forests, often at higher elevations. On the DBNF, this

species is known from the Pine Mountain area and the cliff portion of the forest. It occurs in rich, mixed mesophytic forest under moderate to high shade, where temperatures are moderated.

Black Cohosh – *Cimicifuga racemosa* – Black Cohosh grows in mesic woods throughout its range of much of the eastern North America. It appears to be a moderate calciphile and does best on well-drained soils. On the DBNF, it occurs in mixed mesophytic forest and at the transition from this forest to river floodplain forest. The species will grow in near open conditions, but is usually found in moderate shade. Root diggers have put pressure on populations of this species, but the extent of the collection is unknown. Collection of this species is currently allowed on the DBNF.

Small Enchanter's-nightshade – *Circaea alpina ssp. alpina* – This plant is a northern species with a range extending southward along the Appalachian Mountains. It requires cool, moist conditions. On the DBNF, it is found associated with cold air drainage and narrow sandstone hollows with high shade and humidity. Almost always it is near a stream, but usually out of the floodplain.

Beech Drops – *Epifagus virginiana* – Beech drops is found throughout the range of American beech in eastern North America. It is parasitic, deriving nutrients from an association with American beech (*Fagus grandifolia*) roots. The species, to maintain itself, depends on forests that include Fagus. These can be upland or lower slope forests.

Southern Heartleaf – *Hexastylis contracta* – Distribution of the southern heartleaf is centered on the Cumberland Plateau. In Kentucky most of the population is found in land managed by the Big South Fork National River and Recreation Area. It grows in open to closed yellow pine and yellow pine-oak forest in the vicinity of a stream. It is also known to grow in fescue-dominated roadsides in Tennessee. On the DBNF, the species is known from one drainage. It grows above the stream in moderate to heavy shade provided by mountain laurel and great bay under a canopy of yellow pine-oak forest with scattered eastern hemlock.

Goldenseal – *Hydrastis canadensis* – Goldenseal grows in a variety of habitats ranging from well-drained floodplain to mesic cove forest. On the DBNF, it is known from floodplain sites, mixed mesophytic forest, and drier hardwood forest on limestone. It usually occurs in clusters of not more than a few dozen plants, but a few sites have been found with 1000s of plants. The species is a moderate calciphile and does best in well drained soils with ample available moisture. Shade is usually moderate, and the largest colonies have little or no midstory.

Butternut or White Walnut – *Juglans cinerea* – This tree is distributed from southern Ontario to the southern Appalachians. In the northern portions of the range, the species is usually found on well-drained floodplains, either in open areas or as part of a forest canopy. To the south, the species also occurs in rich, mesic hollows. As young trees, they are intolerant, and require high light. On the DBNF, it is found in both habitat types, but most trees are infected with butternut canker.

Smooth Veiny Peavine – *Lathyrus venosus* – Smooth Veiny Peavine is widespread in eastern North America. It is often found in open dry forest, but may also be found in moist mesic or

terrace forest, and sometimes on stream banks. On the DBNF, it is found in dry-mesic oak and mixed mesophytic forest, often near gaps or other areas of higher light levels.

American Gromwell – *Lithospermum latifolium* – American Gromwell occurs in the northeastern US down through the central Appalachians. It grows in open, dry-mesic forest. On the DBNF, it is usually found on calcareous sites in dry-mesic oak forest or mesic mixed hardwoods.

Carolina Anglepod – *Matelea carolinensis* – Carolina anglepod is a coastal plain species with range extensions along the southern Appalachian Plateaus. It grows in moist, open forest, either yellow pine or hardwood, and in sandy old fields and waste areas. On the DBNF, the single station is on a sandy roadside adjacent to open yellow pine-oak forest.

Ginseng – *Panax quinquefolius* – Ginseng is widely distributed in eastern North America. It grows in a variety of habitats, but is usually found in well drained, mixed mesophytic forest with moderate to high base cation saturation. Early accounts suggest this species was a common element in the herbaceous layer of mixed mesophytic forests. Today it is uncommon at best. Collection pressure for the valuable roots has reduced populations dramatically.

Sanicle – *Sanicula canadensis* – Sanicle is widespread across eastern North America. It occurs in dry-mesic to mesophytic forest. On the DBNF, it is locally common, usually occurring in dry-mesic oak and oak-mixed hardwood forest. It also occurs in mixed mesophytic forest, and occasionally in old fields.

Bay Starvine – *Schisandra glabra* – Bay Starvine is a piedmont and Gulf coastal plain species with outlying populations along the Mississippi River, the Atlantic Ocean and the Cumberland Plateau. In the main part of its range, the species is found in beech-magnolia forest. Elsewhere it is found on loess soils. The single population in Kentucky, partially located on the DBNF, is on talus slopes below sandstone cliffs in mesic tulip poplar-hemlock-beech-oak forest. While the plant can be high climbing, it will creep along the ground. Light to moderate shade with well-drained soils and ample moisture is needed.

Southern Oconee Bells – *Shortia galacifolia* var. *galacifolia* – This plant is a narrow endemic of the southern Appalachian Mountains. It grows in rich woods on stream banks. The only Kentucky record, an introduction in to the Red River Gorge Geological Area (DBNF) is maintaining itself in similar habitat.

Wasioto Rosinweed – *Silphium wasiostense* – Wasioto rosinweed is known only from Kentucky and Tennessee. Most populations are in eastern Kentucky, but one or two are known from the Ridge and Valley of Tennessee. Many of the Kentucky populations are on the DBNF. The plant is found on well-drained river terraces in open forest, scattered in open upland oak forest and on lower slopes. It occurs as one or two-leafed plants except in open areas along roadways, utility rights-of-way or stream terraces. In open areas the plants flower, reaching 6-7 feet tall. The species has a deep taproot suggesting is fire tolerant like many of the prairie silphiums. It is probable that fire once maintained habitat for the species-open oak forest or woodland.

Big-flowered Snowbell – *Styrax grandiflorus* – The big-flowered snowbell is a southern Appalachian Mountains and southeastern coastal plain species. It commonly grows in mixed or deciduous forest in upland locations. There is at least one reliable record for the species in

Kentucky from the DBNF area (McCreary County). Here the plant is growing in mixed mesophytic forest on a north aspect above the Cumberland River.

Northern Mayflower – *Trientalis borealis* – The northern mayflower is a northern species extending southward to Kentucky (interior) and Virginia (coastal plain). It is found in bogs and rich woods. The Kentucky stations, in the DBNF area, are in cool ravines with mixed mesophytic forest below sandstone cliffs.

Running Buffalo Clover – *Trifolium stoloniferum* – This plant inhabits open grassland, open woodland and the transition area between them. Light shade does not harm the plant. The species throughout its range is a calciphile, i.e., it shows a preference for limestone or otherwise base cation-rich soils. Periodic disturbance such as might have occurred while large ungulates passed through a population appears to benefit the plant. A large population in central Kentucky appears to do best with moderate disturbance from grazing/resting cattle. The sole population within the Daniel Boone NF proclamation boundary occurs in an open field.

Gymnosperms

Canada Yew – *Taxus canadensis* – Canada yew is a northeastern species with a range extension southward along the Appalachians. In the northern part of the range, it occurs in mixed mesophytic forest, hemlock forest, and in other hardwood forest where moderate shade and cool temperatures prevail. It is also known from bogs, swamps, gorges, ravine slopes, and rocky banks. On the DBNF, the species is primarily associated with cool air drainages near caves and in deep, shaded hollows. Here it usually is in mixed mesophytic forest. It also occurs on road cuts and cliffs on lower and midslopes within in this forest type.

Monocots

Purple Caric Sedge – *Carex purpurifera* – The purple caric sedge has a narrow range in the Central Hardwoods area. It grows in mesic forests, primarily hardwood. On the DBNF, it is known from several scattered locations all in dry-mesic oak or mixed mesophytic forest. Shade is moderate to light.

Spotted Coralroot – *Corallorhiza maculata* – The spotted coralroot is mostly a northern species with extensions into the Appalachian Mountains. Its habitat is hardwood forest, but occurs under a variety of conditions. In Kentucky, it is known only from Pine Mountain within the DBNF proclamation boundary. It occurs on dry-mesic oak-hardwood forest in rich soil.

Small Yellow Lady's-slipper – *Cypripedium parviflorum* var. *parviflorum* – The small yellow lady's slipper ranges from Canada to the southern Appalachian Mountains. It is most common to the north. It grows in sphagnum bogs and hemlock- white pine woods northward. On the DBNF, a few sites are known, all from open oak forest on lower slopes.

Loesel's Twayblade – *Liparis loeselii* – The Loesel's twayblade is a northern and midwestern North American species. It is found in wet to damp forest. On the DBNF, it is known from wet seeps on roadsides, a seep at the base of an abandoned limestone quarry, and at the edge of a strip mine pond.

Wild Lily-of-the-valley- *Maianthemum canadense*-The wild lily-of-the-valley is a northern North American species with range extensions south along the Appalachian Mountains. It is found in acid, well-drained sites under eastern hemlock and mixed hardwood forest. It is commonly found on rotten logs or hummocks in wet woods. On the DBNF, it is found on lower slopes and upper terraces in eastern hemlock or mixed mesophytic forest. These sites are cool and shady.

Small-flowered False Hellebore – *Melanthium parviflorum* – The small-flowered false hellebore is a central and southern Appalachian Mountains species. It is associated with moist slopes in mesic hardwood forest. On the DBNF, it is known from a few areas from mixed mesophytic forest.

White Fringeless Orchid –*Platanthera integrilabia* – On the Daniel Boone NF, this species is found in streamhead seeps, or rarely streambanks in the vicinity of streamhead wetlands. This species requires the sterile, constantly wet to moist sandy soil found in this habitat. Water in these seeps is always flowing at least below the surface, and is never stagnant. It is possible that this helps keeps the species endophyte fungus associate from damaging the plant. The species almost always grows in mats of *Sphagnum* mosses, but occasionally is associated with leaf litter or a thin layer of organic muck. It is probable *Sphagnum* helps to maintain moisture and soil pH. It is also known to serve as a nursery for seed germination. The canopy associated with these seeps ranges from open to closed. The open conditions encourage butterfly-attracting species such as joe pyeweed, which in turn increase the chances of pollination of the orchid flowers. The closed canopy condition may improve germination and establishment of seedlings.

Small Purple-fringed Orchid – *Platanthera psycodes* – This orchid is a northern species with a range extension south along the Appalachian Mountains. It is found in wet meadows and wet, open forest. On the DBNF, there are tentative records for this species from wet stream terraces under high canopy closed forest. The identity of the plants in question is not certain.

Mosses

Feather Moss or Log Moss – *Hypnum curvifolium* – This moss has a wide distribution in North America. The species is uncommon to common and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Feather Moss or Log Moss – *Hypnum imponens* – This moss has a wide distribution in North America. The species is common to abundant and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Fern Moss or Log Moss – *Thuidium delicatulum* – This moss is a northern US and Canadian species which extends southward in the eastern US to the Gulf coast (and south to northern South

America). It is a usually common species in its habitat, which is on moist soil, humus, rocks, or logs in forest or sometimes meadows or fields. On the DBNF, it is most common in mixed mesophytic forest on rocks, logs and soil, but is also found in dry-mesic forest, and rarely in xeric forest. It also occurs on the DBNF in old fields and meadows, sometimes ruderal areas. This species is widely collected for the horticultural industry and in some areas is becoming scarce.

References:

- Baker, M.D. and Michael J. Lacki. 1997. Short-term changes in bird communities in response to silvicultural prescriptions. *Forest Ecology and Management* 96 (1997) 27-36.
- Barbour R.W. 1971. *Amphibians and reptiles of Kentucky*. The University Press of Kentucky, Lexington, KY.
- Barbour, R.W., C.T. Peterson, D. Rust, H.E. Shadowen and A.L. Whit. 1973. *Kentucky Birds-A Finding Guide*. The University Press of Kentucky, Lexington, KY. 305pp.
- Behler, J.L. and F.W. King. 1979. *The Audubon Society field guide to North American reptiles and amphibians*. Alfred A. Knopf, New York.
- Buehler, D.A., and C.P. Nicholson. 1997. Ecology of the Cerulean Warbler in the Cumberland Mountains and the Southern Appalachians. 1996 Annual Report. Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.
- Conant, R. and J.T. Collins. 1991. *Peterson field guide to reptiles and amphibians: eastern and central North America*. 3rd ed. Houghton Mifflin, Boston.
- DeGraff, R. M., and D.D. Rudis. 1986. *New England Wildlife: Habitat, natural history, and distribution*. NE Forest Experiment Station. US Forest Service. General Technical Report NE-108. 481pp.
- DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. *Forest and rangeland birds of the United States - natural history and habitat use*. USDA Agriculture Handbook 688. 625 pp.
- Hamel, Paul B. 1992. *Land manager's guide to birds of the South*. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437pp.
- Mengel, R.M. 1965. *The birds of Kentucky*. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581pp.
- NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Association for Biodiversity Information, Arlington, VA. Available: <http://www.natureserve.org/>. (Accessed: July 25, 2001).
- Palmer-Ball, B.L. 1996. *The Kentucky breeding bird atlas*. The University Press of Kentucky, Lexington, KY. 372pp.

07/15/2003

Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.

Storm Damage DEIS

VA Dept of Game and Inland Fisheries: VA Fish and Wildlife Information Service. 2001. Available: <http://www.dgif.state.va.us/>. (Accessed July 26, 2001).

Wilson, L.A. 1995. Land manager's guide to the amphibians and reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and the U.S. Forest Service, Southern Region, Atlanta, GA.

07/15/2003

Attachment C.

Species List: Mixed Mesophytic Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
3-Mixed Mesophytic Hardwood	Mixed Mesophytic Forest	(blank)	INSEC	Sixbanded Longhorn Beetle/ <i>Dryobius sexnotatus</i>
			MAMM	Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii</i>
				Virginia Big-eared Bat/ <i>Corynorhinus (Plecotus) townsendii virginianus</i>
			P-DIC	Carolina Allspice or Sweetshrub/ <i>Calycanthus floridus</i>
				Carolina Allspice or Sweetshrub/ <i>Calycanthus floridus</i> var. <i>glaucus</i>
				Green-and-gold/ <i>Chrysogonum virginianum</i> var. <i>virginianum</i>
				Black Cohosh/ <i>Cimicifuga racemosa</i>
				Beech Drops/ <i>Epifagus virginiana</i>
				Southern Heartleaf/ <i>Hexastylis contracta</i>
				Goldenseal/ <i>Hydrastis canadensis</i>
				Butternut/ <i>Juglans cinerea</i>
				Smooth Veiny Peavine/ <i>Lathyrus venosus</i>
				American Gromwell/ <i>Lithospermum latifolium</i>
				Carolina Anglepod/ <i>Matelea carolinensis</i>
				Sanicle/ <i>Sanicula canadensis</i>
				Bay Starvine/ <i>Schisandra glabra</i>
		Acidic Substrate		Southern Heartleaf/ <i>Hexastylis contracta</i>
			P-MOS	Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>
		Aspect (SE to NW)	BIRD	Cerulean Warbler/ <i>Dendroica caerulea</i>
		Aspect (NW to SE)	P-DIC	Big-flowered Snowbell/ <i>Styrax grandiflorus</i>
				Northern Mayflower/ <i>Trientalis borealis</i>
		Closed Forest Canopy	BIRD	Acadian Flycatcher/ <i>Empidonax virescens</i>
			P-DIC	Wasioto Rosinweed/ <i>Silphium wasiotense</i>
			P-DIC	Small Enchanter's-nightshade/ <i>Circaea alpina</i> ssp. <i>alpina</i>
			P-GYM	Canada Yew/ <i>Taxus canadensis</i>
			P-MON	Wild Lily-of-the-Valley/ <i>Maianthemum canadense</i>
		Cool Temperatures	P-DIC	Ginseng/ <i>Panax quinquefolius</i>
				Northern Mayflower/ <i>Trientalis borealis</i>
			P-MON	Loesel's Twayblade/ <i>Liparis loeselii</i>
		Dense shrub understory	BIRD	Cerulean Warbler/ <i>Dendroica caerulea</i>
				Worm-eating warbler/ <i>Helmitheros vermivorus</i>
				Wood Thrush/ <i>Hylocichla mustelina</i>
				Kentucky Warbler/ <i>Oporornis formosus</i>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		Downed Logs	MAMM	Cloudland Deermouse/ <i>Peromyscus maniculatus nubiterrae</i>
			P-MOS	Feather Moss, Log Moss/ <i>Hypnum imponens</i>
			REPT	Southeastern Crowned Snake/ <i>Tantilla coronata</i>
		Dry		Southeastern Crowned Snake/ <i>Tantilla coronata</i>

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
		Elevation (above 2300 ft)	BIRD	Least Flycatcher/ Empidonax minimus
			P-MON	Small-flowered False Hellebore/ Melanthium parviflorum
		Fire Tolerant/Enhanced	BIRD	Least flycatcher/ Empidonax minimus
				Yellow-throated Vireo/ Vireo flavifrons
		Forb/Grass Condition	INSEC	Diana Fritillary/ Speyeria diana
		Forest Interior (Minimal Edge)	BIRD	Cerulean Warbler/ Dendroica caerulea
				Worm-eating Warbler/ Helmitheros vermivorus
				Swainson's Warbler/ Limnodynastes swainsonii
				Yellow-throated Vireo/ Vireo flavifrons
			MAMM	Appalachian Cottontail/ Sylvilagus obscurus
		High Shade	BIRD	Worm-eating Warbler/ Helmitheros vermivorus
			INSEC	Sixbanded Longhorn Beetle/ Dryobius sexnotatus
			P-DIC	Southern Oconee bells/ Shortia galacifolia var. galacifolia
			P-MON	Wild Lily-of-the-Valley/ Maianthemum canadense
				White Fringeless Orchid/ Platanthera integrilabia
			P-MOS	Feather Moss, Log Moss/ Hypnum curvifolium
		Large Decadent Trees	BIRD	Cerulean Warbler/ Dendroica caerulea
			INSEC	Sixbanded Longhorn Beetle/ Dryobius sexnotatus
		Leaf Litter	BIRD	Worm-eating Warbler/ Helmitheros vermivorus
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Mature forest	BIRD	Cerulean Warbler/ Dendroica caerulea
				Worm-eating Warbler/ Helmitheros vermivorus
				Wood Thrush/ Hylocichla mustelina
				Kentucky Warbler/ Oporornis formosus
				American Redstart/ Setophaga ruticilla
		Mid-age Forest		Wood Thrush/ Hylocichla mustelina
				Kentucky Warbler/ Oporornis formosus
		Moderate Shade		Wood Thrush/ Hylocichla mustelina
			P-MON	Spotted Coralroot/ Corallorhiza maculata
			P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Moist	BIRD	Worm-eating Warbler/ Helmitheros vermivorus
				Wood Thrush/ Hylocichla mustelina
				Kentucky Warbler/ Oporornis formosus
			MAMM	Cloudland Deermouse/ Peromyscus maniculatus nubiterrae
			P-DIC	Blue Monkshood/ Aconitum uncinatum spp. uncinatum
				Mountain Black Cohosh/ Cimicifuga americana
				Small Enchanter's-nightshade/ Circaea alpina ssp. alpina
				Southern Oconee bells/ Shortia galacifolia var. galacifolia
			P-MON	Spotted Coralroot/ Corallorhiza maculata
				Small Yellow Lady's-slipper/ Cypripedium parviflorum var. parviflorum
				Loesel's Twayblade/ Liparis loeselii
			P-MOS	Feather Moss, Log Moss/ Hypnum curvifolium
				Feather Moss, Log Moss/ Hypnum imponens
				Fern Moss, Log Moss/ Thuidium delicatulum

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
				Southeastern Crowned Snake/ Tantilla coronata
		Old Growth Condition	MAMM	Cloudland Deermouse/ Peromyscus maniculatus nubiterrae
		Open (Little or No Shade)	INSEC	Diana Fritillary/ Speyeria diana
		Open Forest Canopy	BIRD	Least Flycatcher/ Empidonax minimus
			P-DIC	Bay Starvine/ Schisandra glabra
				Running Buffalo Clover/ Trifolium stoloniferum
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Open Midstory/Understory	BIRD	Cerulean Warbler/ Dendroica caerulea
				Acadian Flycatcher/ Empidonax virescens
				Yellow-throated Vireo/ Vireo flavifrons
		Rich Soil	P-DIC	Mountain Black Cohosh/ Cimicifuga americana
				Beech Drops/ Epifagus virginiana
				Goldenseal/ Hydrastis canadensis
				Butternut/ Juglans cinerea
				Ginseng/ Panax quinquefolius
				Southern Oconee Bells/ Shortia galacifolia var. galacifolia
			P-MON	Purple Caric Sedge/ Carex purpurifera
				Spotted Coralroot/ Corallorhiza maculata
		Riparian	BIRD	American Redstart/ Setophaga ruticilla
			INSEC	Diana Fritillary/ Speyeria diana
			P-DIC	Monkshood/ Aconitum uncinatum (generic)
				Blue Monkshood/ Aconitum uncinatum spp. uncinatum
				Black Cohosh/ Cimicifuga racemosa
				Goldenseal/ Hydrastis canadensis
				Butternut/ Juglans cinerea
				Southern Oconee Bells/ Shortia galacifolia var. galacifolia
			P-MON	Small Purple-fringed Orchid/ Platanthera psycodes
			REPT	Southeastern Crowned Snake/ Tantilla coronata
		Rocky/Rocks	P-DIC	Mountain Black Cohosh/ Cimicifuga americana
			P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
				Southeastern Crowned Snake/ Tantilla coronata
		Seep/Constant Water	P-MON	White Fringeless Orchid/ Platanthera integrilabia
				Small Purple-fringed Orchid/ Platanthera psycodes
		Shrub/Sapling Condition	BIRD	Least Flycatcher/ Empidonax minimus
				American Redstart/ Setophaga ruticilla
		Slope (hillside, steepness)		Worm-eating Warbler/ Helmitheros vermivorus
				Ovenbird/ Seiurus aurocapillus
		Tract Size (Area Sensitive)		Cerulean Warbler/ Dendroica caerulea
				Acadian Flycatcher/ Empidonax virescens
				Worm-eating Warbler/ Helmitheros vermivorus

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		Trees > 20" dbh		Cerulean Warbler/ <i>Dendroica caerulea</i>
		Upland (usually mesic to dry, not subject to holding water)		Cerulean Warbler/ <i>Dendroica caerulea</i>
				Yellow-throated Vireo/ <i>Vireo flavifrons</i>
		Water (Distance Sensitive)	AMPHI	Jefferson Salamander/ <i>Ambystoma jeffersonianum</i>
			BIRD	Acadian Flycatcher/ <i>Empidonax virescens</i>
				American Redstart/ <i>Setophaga ruticilla</i>

Viability Assessment Report For Dry-Mesic Oak Forest Habitat Association

Prepared by
Pamela J. Martin
Daniel Boone National Forest

I. Description of Habitat Association

Dry-mesic oak forests occur throughout the South in all ecological sections, most commonly in the mountains. They are usually found on dry, upland sites on southern and western aspects, and ridgetops. The species composition of this forest type varies greatly due to its wide distribution. The major species include chestnut oak, northern red oak, black oak, white oak, and scarlet oak. Additional associates include southern red oak, post oak, blackjack oak, pignut hickory, mockernut hickory, and red maple. Coniferous species such as shortleaf pine, and eastern white pine may occur as a mixture, with an overstory coverage of less than 25 percent. American chestnut was a major species in this community type up until the 1930's (USDA Forest Service, 1997).

The frequency of fire is important in the disturbance regime for this community type. The dry sites on which this community type occurs are conducive to recurring, low-intensity surface fires thought to have been quite common prior to European settlement. These fires helped maintain the oak component by eliminating fire-sensitive competitors and stimulating oak regeneration. Blowdowns of single or multiple trees result in gap phase regeneration, and infrequent tornadoes can alter an entire stand. Other important disturbances for this community type include oak decline, infestations by gypsy moths and ice storm damage (USDA Forest Service, 1997). Water on these sites is primarily from surface sources (rainfall). On some sites, limited amounts of ground water help maintain the sites. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the Dry-Mesic Oak Habitat Association, also provides energy sources.

The Daniel Boone National Forest (DBNF) occurs in three ecological sections: Interior Low Plateau and Highland Rim, Cumberland Mountains and Northern Cumberland Plateau. On the DBNF, Interior Low Plateau and Highland Rim, dry-mesic oak habitat occurs in the following landtype associations (LTAs) (see USDA Forest Service, 1997a; 1996):

- Triplett Creek Knobs (222En02)
- Knob Flats (222En01)
- Fox Creek Knobs (222En03).

In the Cumberland Mountain ecological section of the DBNF, dry-mesic oak habitat occurs in the following LTA (USDA Forest Service, 1997a; 1996):

- Northern Jellico Mountains (M221Cd001).

The majority of the dry-mesic oak habitat on the DBNF occurs in the Northern Cumberland Plateau ecological section. Dry-mesic oak habitat occurs in the following LTAs (USDA Forest Service, 1997a; 1996):

- Northern Escarpment (221Hb004)
- Northern Low Hills / Cliff Transition (221Hb005)
- Central Knobstone Escarpment (221Hb001)
- Northern Rolling Hills (221 He003)
- North Fork Kentucky Cliffs (221Hb003)
- Central Cliff (221Hb002)
- London-Corbin Plain Transition (221Hc007)
- Rolling Low Hills (221He001)
- Low Hills (221He002)
- Low Hills – Rugged Hills Transition (221Ha002)
- Southern Middle Breathitt Rugged Hills (221Ha001)
- London-Corbin Plain (221Hc006)
- Rockcastle Hills (221Hc005)
- Southern Knobstone Escarpment Transition (221Hc002)
- Southern Cliff (221Hc003)
- Southern Knobstone Escarpment (221Hc001).

On the DBNF, dry-mesic oak habitat occurs from low to high elevations on dry-mesic sites, frequently on linear or convex landforms on north- and east-facing slopes or at high elevations, and sometimes on concave landforms on southerly and westerly aspects. This forest type is concentrated on slopes of moderate exposure, mostly on colluvial Jefferson or Shelocta soils, or on upper slopes or broader ridges with Whitley, Gilpin, Latham or Berks soil series. These soils are mostly derived from sandstone and shale. Since this forest type

occupies average soil conditions, it intergrades with most other forest types (USDA Forest Service et al., 1989).

Dry-mesic oak habitat is common; 40 percent of the forested land on the DBNF is considered dry-mesic oak. Dry-mesic oak forests grade into mesophytic cove hardwoods, white pine-hemlock-hardwoods, and xeric oak forests at low to moderate elevations. On the DBNF, typical dominant species in the Dry-Mesic Oak Habitat Association is white oak with pignut hickory, mockernut hickory, red maple and black gum. Drier, flatter areas are characterized by chestnut oak, scarlet oak and perhaps southern red oak as a minor component. In disturbed areas, *Pinus* spp., persimmon and sassafras are frequent. Moister phases, grading into yellow-poplar or beech forest have frequent red oak, shagbark hickory, and bitternut hickory. In disturbed areas, black locust, black cherry, and smooth sumac are common. Flowering dogwood is often dominant in the understory, other frequent shrubby species include witch hazel, serviceberry, American hazelnut, summer grape, maple leaf viburnum, and greenbrier. Herb cover is generally sparse except on better soils. Frequent species include grape fern, ebony spleenwort, Christmas fern, tall anemone, lance leaved loosestrife, star chickweed, fire pink, three lobed violet, naked flowered tick trefoil, round leaf tick trefoil, common cinquefoil, hairy skullcap, false foxglove, small headed sunflower, wreath goldenrod, calico aster, cornel leaf aster and sedge (USDA Forest Service et al., 1989).

II. Current Status of the Habitat Association on the Daniel Boone National Forest

Dry-mesic oak habitat is widespread occurring on most geologic, topographic and edaphic situations. The dry-mesic oak forest types on the Daniel Boone National Forest are tracked in the Continuous Inventory of Stand Conditions (CISC) and are represented as post oak/blackjack oak (51), white oak/red oak/hickory (53), white oak (54), and northern red oak (55). The management types identified as dry-mesic oak forest types are defined as follows:

(51) = 70+ percent of the dominant and co-dominant basal area is hardwood, and 50+ percent is post oak and/or blackjack oak;

(53) = 70+ percent of the dominant and co-dominant basal area is hardwood, and 50+ percent is white oak/red oak/hickory species;

(54) = 70+ percent of the dominant and co-dominant basal area is hardwood, and 50+ percent is white oak; and

(55) = 70+ percent of the dominant and co-dominant basal area is hardwood, and 50+ percent is northern red oak (USDA Forest Service, 1992).

On the DBNF, approximately 665,000 acres are in forested land. Of this acreage, approximately 40 percent or 266,620 acres are within the dry-mesic oak forest types as described. Utilizing the CISC database, the dry-mesic oak forest type occurring on the Daniel Boone National Forest was further separated by age class and acreage (USDA Forest Service, 1998).

Table 1. Forest types in the Dry-Mesic Oak Habitat Association by age and acre.

Age	Post Oak / Black Oak (51)	White Oak / Northern Red Oak / Hickory (53)	White Oak	Northern Red Oak
0-10	36	25229	429	78
11-20	0	18437	100	0
21-30	0	8177	137	0
31-40	0	13723	102	0
41-50	34	7881	114	25
51-60	0	14356	564	0
61-70	0	31295	2139	0
71-80	113	36639	2542	0
81-90	120	38050	3137	0
91-100	80	34456	1885	22
101-110	106	18734	674	60
111-120	24	5035	598	0
121-130	0	995	132	0
131-140	0	181	31	0
141-150+	0	124	26	0
TOTAL	513	253312	12610	185

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The desired future condition for this habitat association would be to provide amounts of suitable habitat in the proper stages of succession to ensure that the species dependant on the association have a high probability of persistence on the forest. This would involve maintaining a structured age class distribution with emphasis on maintaining a significant component of habitat that contains the habitat modifiers required by various species.

- Evaluate habitats to determine those capable of supporting reintroduction of species at risk.
 - *Rationale: Specific species management within this habitat association may require reintroduction efforts to ensure continued persistence of that particular species or group of species in this association.*
- Dry-Mesic oak types need to be represented in a range of age classes.
 - *Rationale: Dry-mesic oak makes up approximately 40 percent of the forest type on the DBNF. The species identified in this habitat association (insect, plants, amphibian, mammals and birds) require a variety of age classes, elevations and tract*

sizes. Species from the cerulean warbler, which are rarely found in tracts less than 250 hectares (617.5 acres) to the least flycatcher which most of its breeding population is located above 2500 feet elevation. A range of age classes, along with their accompanying attributes, is a necessary component of this habitat association. Age distribution management along with implementation of best management practices should ensure continued persistence of the species identified in this habitat association.

- Where applicable, leave project unit boundaries with irregular and feathered edges.
 - *Rationale: Abrupt habitat changes can create barriers to wildlife passing through the unit.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

Monitoring and inventory of the Dry-Mesic Oak Habitat Association will need to be implemented at a level sufficient to provide data to track the current condition of the habitat. The following items are considered necessary to ensure that the association can be properly evaluated and decisions supported.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 years. Stand (or analysis unit) inventory should also be conducted in response to events that have potential to alter the landscape i.e., windstorms, winter storms, and infestations (high priority).
 - *Rationale: Inventory to identify and update baseline data or assess changed conditions after non-prescribed major disturbances. Inventory may be at the stand level or larger units may be used (such as ecological or habitat units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*
- Employ GIS and vegetation management databases to track the condition and composition of the Dry-Mesic Oak Habitat Association (high priority).
 - *Rationale: The use of FSVeg (CISC or best available science) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the pine habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers.*
- Continue to implement R8 landbird monitoring program (high priority).
 - *Rationale: This monitoring program will help track the persistence of the avian species in this habitat association. This may be a critical element in documenting avian species trends in this association. This monitoring program contains points*

linked to this association it would be considered an excellent tool for both species-specific and association monitoring.

References Cited:

- USDA Forest Service, 1992. Southern Region. Silvicultural examination and prescription field Book. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA.
- USDA Forest Service. 1996. Landtype association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1997. Guidance for conserving and restoring old-growth forest communities on National Forests in the Southern Region: report of the Region 8 old-growth team. Forestry Report R8-FR 62. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA. 117 pp
- USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 1998. Continuous Inventory of Stand Condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1989. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stanton Ranger District. Winchester, KY. 316 pp.

Attachment A.**Species List: Dry-Mesic Oak Habitat Association**

Class	Common/Species
ANIMALS	
Birds	Eastern Wood Pewee/ <i>Contopus virens</i> Cerulean Warbler/ <i>Dendroica caerulea</i> Least Flycatcher/ <i>Empidonax minimus</i> Acadian Flycatcher/ <i>Empidonax virescens</i> Worm-eating Warbler/ <i>Helmitheros vermivorus</i> Wood Thrush/ <i>Hylocichla mustelina</i> Swainson's Warbler/ <i>Limnothlypis swainsonii</i> Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i> Kentucky Warbler/ <i>Oporornis formosus</i> Summer Tanager/ <i>Piranga rubra</i> Ovenbird/ <i>Seiurus aurocapillus</i> American Redstart/ <i>Setophaga ruticilla</i> Yellow-throated Vireo/ <i>Vireo flavifrons</i>
Insects	Diana Fritillary/ <i>Speyeria diana</i>
Mammals	Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii rafinesquii</i> Appalachian Cottontail/ <i>Sylvilagus obscurus</i>
Reptiles	Northern Coal Skink/ <i>Eumeces anthracinus anthracinus</i>
PLANTS	
Dicots	Sweetshrub/ <i>Calycanthus floridus</i> var. <i>glaucus</i> American Chestnut/ <i>Castanea dentata</i> Chinquapin (generic)/ <i>Castanea pumila</i> Sweet-fern/ <i>Comptonia peregrina</i> Beech Drops/ <i>Epifagus virginiana</i> Red-disked Sunflower/ <i>Helianthus atrorubens</i> Southern Heartleaf/ <i>Hexastylis contracta</i> Goldenseal/ <i>Hydrastis canadensis</i> Smooth Veiny Peavine/ <i>Lathyrus venosus</i> American Gromwell/ <i>Lithospermum latifolium</i> Cow-wheat/ <i>Melampyrum lineare</i> (generic) American Cow-wheat/ <i>Melampyrum lineare</i> var. <i>pectinatum</i> Sweet Pinesap/ <i>Monotropsis odorata</i> Gaywings/ <i>Polygala pauciflora</i> Racemed Milkwort/ <i>Polygala polygama</i> var. <i>polygama</i> Wafer Ash, Hop-tree/ <i>Ptelea trifoliata</i> Cumberland Azalea/ <i>Rhododendron cumberlandense</i>

Class	Common/Species
Dicots	Hairy Snout Bean/ <i>Rhynchosia tomentosa</i> American Chaffseed/ <i>Schwalbea americana</i> Ovate Catchfly/ <i>Silene ovata</i> Wasioto Rosinweed/ <i>Silphium wasiotense</i> Big-flowered Snowbell/ <i>Styrax grandiflorus</i> Spiked Hoary-Pea/ <i>Tephrosia spicata</i> Cutleaf Meadow Parsnip/ <i>Thaspium pinnatifidum</i> Velvet Bush Pea/ <i>Thermopsis mollis</i> var. <i>mollis</i> Running Buffalo Clover/ <i>Trifolium stoloniferum</i> Toothache-tree/ <i>Zanthoxylum americana</i>
Monocots	Purple Caric Sedge/ <i>Carex purpurifera</i> Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i> Spotted Coralroot/ <i>Corallorhiza maculata</i> Wood Lily/ <i>Lilium philadelphicum</i> var. <i>philadelphicum</i> Wild Lily-of-the-valley/ <i>Maianthemum canadense</i> Rough Dropseed/ <i>Sporobolus clandestinus</i>
Mosses	Dog Paw or Elegant Moss/ <i>Dicranum scoparium</i>
FUNGI	Sulphur Shelf/ <i>Laetioporus sulphureus</i> Morel/ <i>Morchellus esculentus</i>

07/15/2003

Attachment B.

Dry-Mesic Oak Forest Species/Habitat Relationship with References

ANIMALS

Birds

Eastern Wood Pewee – *Contopus virens* – This species preferred habitat is rather open mature woodland in a rather dry situation (Hamel, 1992). This species may be absent from younger, second growth forest where an open midstory has not yet developed. In such habitat they often frequent edges and road or stream corridors (Palmer-Ball, 1996). They typically utilize large deciduous trees for the nest site but may use conifers in mixed forest types. This species may be found in numbers in most major forest types examined in Kentucky (Mengel, 1965). This species would be attracted to the hardwood dominance of these forests for nesting, especially where drier, more open conditions prevail.

Cerulean Warbler – *Dendroica caerulea* – Cerulean warblers depend primarily on extensive tracts of mature, relatively undisturbed, deciduous forest. These birds occur in floodplains and upland sites that have large trees (> 20" dbh) in which to nest. Both nesting and foraging take place in the canopies of hardwoods. Stands are usually somewhat open, with little understory; however, according to Buehler and Nicholson, monitoring data suggest that breeding territories in the Cumberland Mountains tend to have fewer canopy trees and greater shrub coverage than those elsewhere. The birds are rarely found in tracts less than 250 hectares, whereas maximum population densities occur in tracts greater than 3000 ha (1997). Hamel gives a minimum tracts size of 1750 ha (1992). This species would be attracted to the hardwood dominance of these forests, especially where drier, more open conditions prevail.

Least Flycatcher – *Empidonax minimus* – This is a species of open conditions; it is rarely encountered deep in the forest. Open, deciduous woods (particularly those that have been disturbed by burning or logging), forest edge, fields with scattered large trees, and other habitats that provide early successional conditions are utilized. During spring migration, Mengel observed male birds in alders and willows in a marshy, Laurel County meadow (1965). Most of the breeding population frequents elevations above 2500 feet. This species would be attracted to the hardwood dominance of these forests, especially where drier, more open conditions prevail.

Acadian Flycatcher – *Empidonax virens* – This species is usually found near water generally near a stream course or some small waterway (Hamel, 1992). It generally uses an open, moderate understory for feeding in a stand with tall trees and closed canopy (DeGraaf et. al., 1991). It is associated with forested tracts at least 37 hectares (91.4 acres) in size (Hamel, 1992). DBNF monitoring data indicates that the greatest number of occurrences for this species were in mesophytic-cove habitats greater than 80 years old. Assuming a stream is nearby, this species would be attracted to the dry-mesic oak forest where a closed canopy exists and a dense, thick understory and more mesic conditions prevail

Worm-eating Warbler – *Helmitheros vermivorus* – Worm-eating warblers inhabit moist, shady forest on moderate to steep slopes. In Eastern KY, the birds are common on deeply shaded slopes in mixed mesophytic woods and moist ravines (Mengel 1965). They are usually found in fairly

mature deciduous or mixed forest with a dense understory, preferably of *Rhododendron* and Mountain Laurel, but will also use younger forest and forest edge. Nesting is typically on sloping ground among leaf litter, while foraging is carried out on the ground or among understory vegetation. Although the species occurs in dissected woodland, it avoids isolated tracts (Palmer-Ball 1986). Hamel lists the minimum necessary tract size as 370 ha (1992). This species would be attracted to the hardwood dominance of these forests, especially where damp, shaded and more mesic conditions prevail.

Wood Thrush – *Hylocichla mustelina* – The wood thrush is found in a wide variety of forest types, provided a well-developed understory is present. Moderately shaded, deciduous and mixed stands of mature trees with a dense shrub and/or sapling understory are typical habitat, particularly when occurring on moist sites. Rich hardwood and bottomland forests are favored; however, drier sites may be used, so long they have the relatively dense shrub layer. Nesting is in shrubs, vines, and small trees. Although the species will tolerate some fragmentation of habitat, it is most common in extensive forest and requires a minimum tract size of 3 hectares (Hamel 1992). This species would be attracted to the hardwood dominance of these forests, especially where damp, shaded, and more mesic conditions and a dense hardwood understory prevail.

Swainson's Warbler – *Limnithlypis swainsonii* – This forest interior species is found within tracts of moist, extensive forest that have dense understory (Palmer-Ball, 1996). Hemlock ravines, having dense growths of rhododendron and laurel, and bottomland forest, with a well-developed understory and/or thickets of small trees, are favored locations. Dense cane breaks are also used. On the DBNF, this bird is often observed in damp, shady hemlock ravines with an understory of rhododendron, near small streams (L.Perry, pers. obs.). Assuming a stream is nearby, this species would be attracted to the dry-mesic oak forest where a closed canopy exists and a dense, thick understory and more mesic conditions prevail.

Red-headed Woodpecker – *Melanerpes erythrocephalus* – Semi-open to open habitat with an abundance of large (> 14" dbh), dead trees is preferred for both breeding and wintering purposes. Relatively open, mature woods, swamps, clearings within mixed woodland, forest edges, and places where groves of trees are present, such as park-like settings, are commonly used. On the DBNF, the birds are often observed in pine-dominated stands that have been frequently burned (L. Perry, pers. obs.). Nesting is in dead trees, or in dead limbs of live trees (Mengel 1965). This species generally avoids mature closed canopy forest during the breeding season (Palmer-Ball 1986). This species would be attracted to dry and more open conditions often found in this habitat association.

Kentucky Warbler – *Oporornis formosus* – Kentucky warblers are most frequent in moist, shady, deciduous and mixed (with pine or hemlock) forest types with dense, shrubby understory. However, in Eastern KY they occur in virtually all major associations except the most xeric pine and pine-oak communities, and may even invade them (Mengel 1965). Mature stands are required, though some younger stands and shrubby woodland borders are used, as well. These ground-nesting birds forage in understory vegetation, leaf litter, and soil. By providing a well-developed shrub layer, many tracts disturbed by selective logging are suitable for nesting even though the canopy has been disrupted (Palmer-Ball 1986). In general, these birds have adjusted better to landscape disturbance than other woodland warblers. This species would be attracted to the hardwood dominance of these forests, especially where damper, more mesic conditions prevail along with a dense hardwood understory.

Summer Tanager – *Piranga rubra* – Relatively dry sites, which tend to produce stands of a semi-open condition, are frequented by this species. Uplands are commonly used, but the birds may occur in a variety of habitats, including bottomlands and wooded residential areas. Forest types range from hardwood to pine-hardwood stands of open to medium density. On the DBNF, the birds are frequently found in mature, mixed pine stands that have been burned and undergone midstory removal (L. Perry, pers. obs.). Oaks are often chosen for nesting, in open woodland or forest edge and often over open spaces such as roads and clearings (Mengel 1965). This species would be attracted to the oak dominance of these forests, especially where drier, more open conditions prevail.

Ovenbird – *Seiurus aurocapillus* – Mature and second growth forest conditions are utilized, on dry to moderately moist sites with light to moderate understory. Birds are more common in stands with closed canopies and open ground—This is a ground nesting species that forages in the leaf litter or on the soil. Mengel observed nests on logging roads and under small logs, sheltered by ferns, on steep, mesophytic slopes (1965); however, Baker and Lacki note that birds are more abundant in non-harvested than in harvested areas (1997). Upland stands and sloping terrain are preferred, but a variety of deciduous and mixed (e.g., pine-oak) forest types are used. This is a forest interior species having a minimum necessary tract size of 15 ha (Hamel 1992). This species would be attracted to the hardwood dominance of these forests.

American Redstart – *Setophaga ruticilla* – This species typically utilizes younger forest and forest in early to mid stages of succession (Palmer-Ball, 1996). It usually occurs near water or streams preferring moist situations to dry ones (Barbour et. al., 1973)(Hamel, 1992). Occurs in altered forest situations including selectively logged areas (Palmer-Ball, 1996). DBNF monitoring data indicates this species most common in forests 41 to 80 years old. This species would be attracted to the hardwood dominance of these forests, especially where damper, more shaded and mesic conditions prevail.

Yellow-throated Vireo – *Vireo flavifrons* – Extensive tracts of relatively mature woodland are necessary for this interior breeding bird. Large, deciduous trees within a variety of forest types, including mixed mesophytic cove, pine-oak, and oak hickory upland forest, are favored. Isolated or much-dissected tracts are avoided; however, the bird will tolerate a certain amount of disturbance (from fire, selective logging) without being dramatically affected (Palmer-Ball 1986). Rather, activities that serve to result in a fairly open midstory/understory can be beneficial, as the birds frequent trees within relatively open settings. Yellow-throated vireos on the DBNF are often observed in hardwoods within mixed pine-hardwood stands that have been burned or had midstory reduction (L. Perry, pers. obs.). This species would be attracted to the hardwood dominance of these forests, especially where drier, more open conditions prevail.

Insects

Diana Fritillary- *Speyeria diana* -On the Daniel Boone, this butterfly is found in open areas and within the forest especially those that are open and well-lit. These conditions mimic open prairies and pine barrens from which the species is known further west and may be found along grassland/forest edge or in forests that have been maintained in an open condition by repeated fires. The caterpillar feeds almost exclusively on violets and overwinter above-ground making them sensitive to spring and fall fires. Midstory removal and prescribed fire can create high quality foraging habitat for adults by increasing nectar sources. A variety of species are used,

including common and swamp milkweeds, ironweed, red clover, coneflowers and butterfly bush. Individuals will use small openings and roadsides along forest edges in search of nectar plants, but do not go far from the woods.

Mammals

Rafinesque Big-eared Bat – *Corynorhinus (Plecotus) rafinesquii rafinesquii* – This bat is a year-round resident throughout the DBNF. During the summer it forages in a variety of forested habitats and in forest edges and open areas. During the day it will roost in limestone and sandstone rockhouses and caves, in hollow trees and under exfoliating bark. During the summer males tend to be solitary roosters while females form maternity colonies. Several maternity colonies, usually associated with cliffline caves and rockhouses, occur on the forest. This species is insectivorous and feeds primarily on moths. Foraging sites often occur along clifflines or ridgelines in an oak-hickory habitat. Cliffline associated rock shelters are used as feeding sites. Clifflines are also thought to provide travel corridors for the Rafinesque's big-eared bat. During the summer this species normally forages within about one mile of the roost site. Hibernation sites occur mainly in caves, but some sites occur in rockshelters and in large cracks in sandstone cliffline. This species is very sensitive to human disturbance of both its hibernation and maternity colony sites.

Appalachian Cottontail Rabbit – *Sylvilagus obscurus* – This mammal is a forest dwelling species that occurs on the DBNF in areas ranging from conifer-northern hardwood to mixed mesophytic to dry-mesic oak forest. It is regarded as a forest interior species susceptible to habitat fragmentation. It prefers relatively cool, understory areas of ericaceous vegetation such as mountain laurel, rhododendron and blueberries. Large tracts of contiguous, relatively old forest overstory vegetation are needed to provide viable populations of this species.

Reptiles

Northern Coal Skink - *Eumeces anthracinus anthracinus* - The Appalachian population of this subspecies extends into eastern KY, while a disjunct population occurs in the west-central part of the State. Suitable habitat includes damp forests of oak, oak-poplar, oak-hickory-pine, and mixed pine-hardwood with moist soils, abundant leaf litter, logs, and/or loose stones; humid wooded or rocky hillsides; rocky bluffs; and similar areas near water sources, such as streams, springs, swamps, and bogs. These skinks seek the cover of rocks, logs, stumps, brush, and rock slabs. When pursued, they will take refuge in shallow water, hiding under rocks at the bottom. Various rocky areas in which they have been found include: on limestone ledges; in dry leaves beneath rock ledges; beneath flat slabs of sandstone; under rocks in sunlit forest openings and in grassy cut over areas in hardwoods; and under rocks in the slope of a road cut through a mixed forest (VA Dept. of Game and Inland Fisheries 2001). Use of fire to maintain grassy openings within forested stands is of benefit to this species. Coal skinks feed primarily on insects and spiders.

FUNGI

Sulfur Shelf – *Laetioporus sulphureus* – Sulfur shelf is a widely distributed fungus. It is a shelf fungus, and grows on decadent or dead oak trees. On the DBNF, it is somewhat uncommon,

occurring usually on large oaks near some kind of open space, such as a field, road corridor, or stream.

Common Morel – *Morchellus esculentus* – The common morel is a widely distributed species. It is generally found in dry-mesic forest. On the DBNF, the species is widespread, usually found in dry-mesic oak forest on mid to lower slope. The species may be more common than perceived, as it does not produce ascocarps except under the correct conditions of moisture and temperature.

PLANTS

Dicots

Sweetshrub or Carolina Allspice – *Calycanthus floridus* var. *glaucus* – Sweetshrub or Carolina Allspice is a southern species found in a variety of habitats, but usually along waterways. It often grows in large colonies. On the DBNF is found on stream terraces that are well-drained and seldom subject to flooding. The overstory is usually open and composed of mixed oak-hardwoods, sometimes with southern yellow pine. One site occurs on the upper portions of a toe slope in oak forest.

American Chestnut - *Castanea dentata* – American chestnut is far less common today than it once was. A fungal disease introduced from Asia in 1904 decimated the species in about 30 years. The species sprouts prolifically and sprouts are still found through its range. American chestnut once dominated much of what is now upland oak forest. On what is now Daniel Boone National Forest land, American chestnut was found on narrow sandstone and conglomerate ridges along the edge of the escarpment and in the Redbird area. It was associated with chestnut oak. Scarlet and black oaks replaced it on these sites. Today on the Daniel Boone National Forest, sprouts are common to scarce on upper slopes and ridges near the escarpment and on portions of the Redbird District. The species grows on acid soils that are generally poor, dry, and located on sites subject to fire. It is believed that fire promoted the species.

Chinquapin – *Castanea pumila* (generic) – This tree occurs in upland hardwood forest. It is usually found on dry sites, and usually under a partially open canopy. On the DBNF the species occurs as the variety *pumila*, which is discussed under other habitat associations.

Sweet Fern – *Comptonia peregrina* – The sweet fern is associated with open, sterile, sandy ground throughout most of its range, where it forms dense, low thickets. In this habitat, fires probably helped maintain the habitat. On the DBNF, this species inhabits open cobble/boulder bars along free-flowing rivers. The plants are found rooted deep in the crevices between boulders. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition.

Beech Drops – *Epifagus virginiana* – This plant is found throughout the range of American beech in eastern North America. It is parasitic, deriving nutrients from an association with American beech (*Fagus grandifolia*) roots. The species, to maintain itself, depends on forests that include *Fagus*. These can be upland or lower slope forests.

Red-disked Sunflower - *Helianthus atrorubens* – This sunflower is a southern and prairie species commonly occurring in warm season grassland. It also is found in open yellow pine forest. On the Daniel Boone National Forest, this species is most abundant in warm season grassland. This habitat in powerline rights-of-way holds most of the Daniel Boone National Forest population. Scattered plants and clumps are found in open yellow pine and yellow pine-oak forest. Fire enhances flowering of this species and maintains its habitat.

Southern Heartleaf – *Hexastylis contracta* – Distribution of the southern heartleaf is centered on the Cumberland Plateau. In Kentucky most of the population is found in land managed by the Big South Fork National River and Recreation Area. It grows in open to closed yellow pine and yellow pine-oak forest in the vicinity of a stream. It is also known to grow in fescue-dominated roadsides in Tennessee. On the DBNF, the species is known from one drainage. It grows above the stream in moderate to heavy shade provided by mountain laurel and great bay under a canopy of yellow pine-oak forest with scattered eastern hemlock.

Goldenseal – *Hydrastis canadensis* – Goldenseal grows in a variety of habitats ranging from well-drained floodplain to mesic cove forest. On the DBNF, it is known from floodplain sites, mixed mesophytic forest, and drier hardwood forest on limestone. It usually occurs in clusters of not more than a few dozen plants, but a few sites have been found with 1000s of plants. The species is a moderate calciphile and does best in well drained soils with ample available moisture. Shade is usually moderate, and the largest colonies have little or no midstory.

Smooth Veiny Peavine – *Lathyrus venosus* – The smooth veiny peavine is widespread in eastern North America. It is often found in open dry forest, but may also be found in moist mesic or terrace forest, and sometimes on stream banks. On the DBNF, it is found in dry-mesic oak and mixed mesophytic forest, often near gaps or other areas of higher light levels.

American Gromwell – *Lithospermum latifolium* – This plant occurs in the northeastern US down through the central Appalachians. It grows in open, dry-mesic forest. On the DBNF, it is usually found on calcareous sites in dry-mesic oak forest or mesic mixed hardwoods.

Cow-wheat – *Melampyrum lineare* (generic) – This plant is somewhat confused with numerous uses by various authors. Following Medley (1993), only the var. *pectinatum* is likely to present on the DBNF. Specimens not identified to variety from the DBNF area are assumed to be this variety. Habitat details are described below for the variety.

American Cow-wheat – *Melampyrum lineare* var. *pectinatum* – This variety, the one found on the DBNF, has been carried as var. *lineare* on the DBNF based on a literature citation. Medley (1993) argues against this and places all plants in the DBNF area in var. *pectinatum*. This is a coastal plain species. It is found in sandy, open yellow pine forest. On the DBNF, the sole station for the species is from ridgetop dry-xeric oak and oak-yellow pine forest.

Sweet Pinesap – *Monotropsis odorata* – Sweet Pinesap is a central and southern Appalachian provinces species. It is saprophytic, gaining carbohydrate nutrients from associations with soil fungi. The species appears to be associated with ericaceous shrubs and or yellow pine in dry forest. It is usually found in or at the base of dense thickets of *Rhododendron maximum*, *R. catawbiense*, or *Kalmia latifolia*, usually with yellow pine, but sometimes with upland oaks. Populations on the DBNF are found in similar habitat with the exception of one or two which are

moist microhabitat associated with shaded cliffs. Fire likely is important to the maintenance of the community in which *Monotropsis* lives and is unlikely to harm the species as it occurs mostly underground except for flowering.

Gaywings – *Polygala pauciflora* – Gaywings is a northern species with extend range through the southern Appalachians. It is found in rich moist forest. On the DBNF, one station is known from a mesic ravine in oak-hardwood forest.

Racemed Milkwort – *Polygala polygama* var. *polygama* – This plant has a midwestern and coastal plain distribution. It is usually found on dry, sandy soil in open forest or grassland. The DBNF sites are on sandy soil in open, ridge top, yellow pine-oak forest or sandy, grassy openings.

Wafer Ash or Hop-tree – *Ptelea trifoliata* (as ssp. *trifoliata* var. *trifoliata* per Medley, 1993) – The wafer ash or hop-tree is found in eastern North American. It is found in moist or rich forest. On the DBNF, it is infrequent but locally abundant on limestone outcrops in open dry-mesic forest or along roadsides.

Cumberland Azalea – *Rhododendron cumberlandense* – This azalea is restricted to the central Appalachian Mountains. It grows in open oak and oak-yellow pine forest, usually on dry, rocky slopes or ridges. It usually occurs as scattered individuals, but may form small clumps. The DBNF populations are in the same habitat. Most occurrences are in the Jellicos and on the Redbird District.

Hairy Snout Bean – *Rhynchosia tomentosa* (var. *tomentosa*) – The hairy snout bean is found throughout most of the southeastern US. It grows in dry, open, often sandy, oak or yellow pine forest, at forest margins, in sandhills, and occasionally in mesic forest. The DBNF sites are all in warm season grassland, or low disturbed vegetation along roads or under powerline rights-of-way.

American Chaffseed – *Schwalbea americana* – This plant occurs in two general kinds of habitats, wet and dry. In all cases, soils are sandy and somewhat sterile. In wet habitats, the combination of constant water and periodic fire maintain the site in an open condition. The overstory is open as are the midstory and shrub layers beneath it. Generally wet sites are grassy with few shrubs. Periodic fire helps to maintain the open condition of the sites. It also plays a role in triggering flowering. This habitat type is not known from the DBNF. Dry habitats likewise are open with a thin overstory and open midstory and shrub layers. These sites are generally a mixture of forbs, grasses, and low shrubs. Some dry habitats are subjected to periodic burns, which help to maintain the open condition. Fire here also helps to trigger flowering. In other dry habitats, the openness is more edaphically controlled. The historic sites on the DBNF fall into this group. Here fire would have triggered flowering. Other dry DBNF sites could, with periodic fire, support *Schwalbea* populations.

Ovate Catchfly – *Silene ovata* – The ovate catchfly is uncommon throughout its range. It is found in open oak woods, often on limestone substrates. It grows in light to moderate shade. The DBNF sites are in open oak woods on limestone and appear to have burned in past years. The midstory and shrub layers are thin, and the canopy somewhat open.

Wasioto Rosinweed – *Silphium wasiostense* – This plant is known only from Kentucky and Tennessee. Most populations are in eastern Kentucky, but one or two are known from the Ridge and Valley of Tennessee. Many of the Kentucky populations are on the DBNF. The plant is found on well-drained river terraces in open forest, scattered in open upland oak forest and on lower slopes. It occurs as one or two-leafed plants except in open areas along roadways, utility rights-of-way or stream terraces. In open areas the plants flower, reaching 6-7 feet tall. The species has a deep taproot suggesting is fire tolerant like many of the prairie silphiums. It is probable that fire once maintained habitat for the species-open oak forest or woodland.

Big-flowered Snowbell – *Styrax grandiflorus* – The big-flowered snowbell is southern Appalachian Mountains and southeastern coastal plain species. It commonly grows in mixed or deciduous forest in upland locations. There is at least one reliable record for the species in Kentucky from the DBNF area (McCreary County). Here is growing in mixed mesophytic forest on a north aspect above the Cumberland River.

Spiked Hoary-pea – *Tephrosia spicata* – This plant is a southern species with a number of more northern stations. It is commonly found in dry to wet, open yellow pine or yellow pine-hardwood forest, roadsides, clearings and fields. On the DBNF, the species is found on boulder/cobble bars along larger streams and rivers of the Cumberland River drainage. A few sites are known from sandy, sparsely shaded openings on ridges.

Cutleaf Meadow Parsnip – *Thaspium pinnatifidum* – The cutleaf meadow parsnip is associated throughout its range with calcareous bedrock including limestone, siltstone, and dolomite. It is a species of moderately shaded forestland. On the DBNF, it is found in open oak or oak-cedar forest on limestone and calcareous siltstone on the Morehead District.

Velvet Bush Pea – *Thermopsis mollis* var. *mollis* – The velvet bush pea is Piedmont species that occurs in the mountains and coastal plain as well. It grows on sandy slopes and in dry oak or oak-yellow pine forest usually on ridges. The DBNF sites, the only Kentucky locations, are on broad, sandy ridges in dry-xeric to dry-mesic oak forest. The species only flowers in open areas such as along roads or in tree gaps. It has been observed to form dense patches on disturbed sandy ground. The rhizome is stout and several inches below the surface, suggesting along with the habitat, that fire is beneficial for the species.

Running Buffalo Clover – *Trifolium stoloniferum* – Running buffalo clover inhabits open grassland, open woodland and the transition area between them. Light shade does not harm the plant. The species throughout its range is a calciphile, i.e., it shows a preference for limestone or otherwise base cation-rich soils. Periodic disturbance such as might have occurred while large ungulates passed through a population appears to benefit the plant. A large population in central Kentucky appears to do best with moderate disturbance from grazing/resting cattle. The sole population within the Daniel Boone NF proclamation boundary occurs in an open field.

Toothache-tree – *Zanthoxylum americana* – The toothache tree is found in much of northern North America south to the Gulf coastal plain. It grows in moist forest and forest edges. On the DBNF, it is infrequent but locally abundant on limestone outcrops in open dry-mesic forest or along roadsides.

Monocots

Purple Caric Sedge – *Carex purpurifera* – This sedge has a narrow range in the Central Hardwoods area. It grows in mesic forests, primarily hardwood. On the DBNF, it is known from several scattered locations all in dry-mesic oak or mixed oak-yellow pine forest. Shade is moderate to light.

Appalachian Spreading Pogonia – *Cleistes bifaria* – The Appalachian spreading pogonia ranges from the Appalachian Plateaus to the Piedmont. It is found in a variety of sites ranging from glades to open forest to warm season grassland to streamhead wetlands. It occurs on well-drained substrates (on hummocks in wetlands) usually in open or partially open conditions. The plants can be single or occur in colonies. On the DBNF, it is known from glades, streamhead wetlands, seep slopes, and on road cuts in upland oak forest. Fire enhances flowering and total numbers of plants. Fire probably helps to maintain habitat as well.

Spotted Coralroot – *Corallorhiza maculata* – The spotted coralroot is mostly a northern species with extensions into the Appalachian Mountains. Its habitat is hardwood forest, but occurs under a variety of conditions. In Kentucky, it is known only from Pine Mountain within the DBNF proclamation boundary. It occurs on dry-mesic oak-hardwood forest in rich soil.

Wood Lily – *Lilium philadelphicum* var. *philadelphicum* – This lily occurs from New England to NC and Kentucky. It is found in open, usually dry forest or in open fields or warm season grass areas. On the DBNF, it is known from open yellow pine-oak forest, roadsides, warm season grassland, and old fields. It requires open conditions and is soon choked out by heavy cover of herbaceous or woody species. Fire maintains its habitat and promotes the plant.

Wild Lily-of-the-valley – *Maianthemum canadense* – This plant is a northern North American species with range extensions south along the Appalachian Mountains. It is found in acid, well-drained sites under eastern hemlock and mixed hardwood forest. It is commonly found on rotten logs or hummocks in wet woods. On the DBNF, it is found on lower slopes and upper terraces in eastern hemlock or mixed mesophytic forest. These sites are cool and shady.

Rough Dropseed – *Sporobolus clandestinus* – Rough dropseed is tall grass prairie species, which also occurs on the coastal plain. It is found in dry sandy soil of prairies, openings, barrens, and along roadways and other rights-of-way. On the DBNF, the species is found in McCreary and Pulaski Counties on limestone cliffs and open, sandy yellow pine or yellow pine-oak forest.

Mosses

Dog Paw Moss or Elegant Moss – *Dicranum scoparium* – This moss is found throughout most of eastern North America. It is relatively common on shaded sandstone boulders, outcrops and cliffs. It also occurs on soil in upland forest. It appears to require moderate shade and acid conditions, but will live in moist to dry environments. The species is often subject to fire and frequently portions of clumps are burned, but not the entire clump. The species is collected for the horticultural industry. It may serve as a refugium for some species during fire events, and act as water reservoir and soil stabilizer following fire.

References:

Baker, M.D. and Michael J. Lacki. 1997. Short-term changes in bird communities in response to silvicultural prescriptions. *Forest Ecology and Management* 96 (1997) 27-36.

- Buehler, D.A., and C.P. Nicholson. 1997. Ecology of the Cerulean Warbler in the Cumberland Mountains and the Southern Appalachians. 1996 Annual Report. Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.
- DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and Rangeland Birds of the United States - Natural History and Habitat Use. USDA Agriculture Handbook 688. 625 pp.
- Hamel, Paul B. 1992. Land Manager's Guide to Birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Medley, M.E. 1993. An annotated catalog of the known or reported vascular flora of Kentucky. Unpublished dissertation. University of Louisville. [A reset, reduced type copy from TNC/KSNPC].
- Mengel, R.M. 1965. The Birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581pp.
- Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky, Lexington, KY. 372pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.

07/15/2003

Attachment C.

Dry-Mesic Oak Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
4-Dry-Mesic Oak	Dry-Mesic Oak Forest	(blank)	BIRD	Eastern Wood Pewee/ Contopus virens
			FUNGI	Morel/ Morchellus esculentus
			INSEC	Diana Fritillary/ Speyeria diana
			P-DIC	Sweetshrub/ Calycanthus floridus var. glaucus
				Chinquapin (generic)/ Castanea pumila
				Beech Drops/ Epifagus virginianana
				Smooth Veiny Peavine/ Lathyrus venosus
				American Gromwell/ Lithospermum latifolium
				Cow-wheat/ Melampyrum lineare
				American cow-wheat/ Melampyrum lineare var. pectinatum
				Sweet Pinesap/ Monotropsis odorata
				Big-flowered Snowbell/ Styra grandiflorus
				Velvet Bushpea/ Thermopsis mollis var. mollis
				Running Buffalo Clover/ Trifolium stoloniferum
			P-MON	Wild Lily-of-the-Valley/ Maianthemum canadense
		Acidic Substrate	P-MOS	Dog Paw Moss, Elegant Moss/ Dicranum scoparium
		Basic Substrate	P-DIC	Goldenseal/ Hydrastis canadensis
				Ovate Catchfly/ Silene ovata
				Cutleaf Meadow-parsnip/ Thaspium pinnatifidum
				Toothache-tree/ Zanthoxylum americana
		Basic Substrate	P-MON	Purple Caric Sedge/ Carex purpurifera
		Closed Forest Canopy	BIRD	Acadian Flycatcher/ Empidonax virescens
				Ovenbird/ Seiurus aurocapillus
				Worm-eating Warbler/ Helmitheros vermivorus
				Wood Thrush/ Hylocichla mustelina
				Swainson's Warbler/ Limnolthypis swainsonii
				Kentucky Warbler/ Oporornis formosus
				Ovenbird/ Seiurus aurocapillus
		Dry		Ovenbird/ Seiurus aurocapillus
				Summer Tanager/ Piranga rubra
			P-DIC	Spiked Hoary-pea/ Tephrosia spicata
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
				Rough Dropseed/ Sporobolus clandestinus
		Elevation (above 2300 ft)	BIRD	Least Flycatcher/ Empidonax minimus
			P-DIC	Gaywings/ Polygala pauciflora
				Southern Heartleaf/ Hexastylis contracta
		Fire Tolerant/Enhanced	BIRD	Least Flycatcher/ Empidonax minimus

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i>
				Yellow-throated Vireo/ <i>Vireo flavifrons</i>
			P-DIC	Wasioto Rosinweed/ <i>Silphium wasiotense</i>
		Forb/Grass Condition	P-DIC	Velvet Bushpea/ <i>Thermopsis mollis</i> var. <i>mollis</i>
		Forest Interior (Minimal Edge)	BIRD	Cerulean Warbler/ <i>Dendroica caerulea</i>
				Worm-eating Warbler/ <i>Helmitheros vermivorus</i>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
				Ovenbird/ <i>Seiurus aurocapillus</i>
				Yellow-throated Vireo/ <i>Vireo flavifrons</i>
			MAMM	Appalachian Cottontail/ <i>Sylvilagus obscurus</i>
		High Shade	BIRD	Worm-eating Warbler/ <i>Helmitheros vermivorus</i>
		High/Constant Humidity (Microclimate)	REPT	Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i>
		Large Decadent Trees	BIRD	Eastern Wood Pewee/ <i>Contopus virens</i>
			FUNGI	Sulphur Shelf/ <i>Laetioporus sulphureus</i>
		Leaf Litter	BIRD	Worm-eating Warbler/ <i>Helmitheros vermivorus</i>
				Ovenbird/ <i>Seiurus aurocapillus</i>
		Mature forest		Eastern Wood Pewee/ <i>Contopus virens</i>
				Cerulean Warbler/ <i>Dendroica caerulea</i>
				Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i>
				Kentucky Warbler/ <i>Oporornis formosus</i>
				Ovenbird/ <i>Seiurus aurocapillus</i>
				American Redstart/ <i>Setophaga ruticilla</i>
		Mid-age Forest		Eastern Wood Pewee/ <i>Contopus virens</i>
		Mid-age Forest	BIRD	Ovenbird/ <i>Seiurus aurocapillus</i>
				Yellow-throated Vireo/ <i>Vireo flavifrons</i>
		Moderate Shade	P-DIC	Velvet Bushpea/ <i>Thermopsis mollis</i> var. <i>mollis</i>
			P-MON	Wood Lily/ <i>Lilium philadelphicum</i> var. <i>philadelphicum</i>
		Moist	BIRD	Worm-eating Warbler/ <i>Helmitheros vermivorus</i>
				Wood Thrush/ <i>Hylocichla mustelina</i>
				Kentucky Warbler/ <i>Oporornis formosus</i>
			P-MON	Spotted Coralroot/ <i>Corallorhiza maculata</i>
		Old Growth Condition	MAMM	Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii rafinesquii</i>
		Open (Little or No Shade)	BIRD	Summer Tanager/ <i>Piranga rubra</i>
			P-DIC	Red-disked Sunflower/ <i>Helianthus atrorubens</i>
				Wasioto Rosinweed/ <i>Silphium wasiotense</i>
				Cutleaf Meadow-parsnip/ <i>Thaspium pinnatifidum</i>
			P-MON	Purple Caric Sedge/ <i>Carex purpurifera</i>
			P-MOS	Dog Paw Moss, Elegant Moss/ <i>Dicranum scoparium</i>
		Open Forest Canopy	BIRD	Least Flycatcher/ <i>Empidonax minimus</i>
				Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i>
				Summer Tanager/ <i>Piranga rubra</i>
			P-DIC	American Chestnut/ <i>Castanea dentata</i>
		Open Forest Canopy	P-DIC	Sweet-fern/ <i>Comptonia peregrina</i>

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
		Open Midstory/Understory	BIRD	Eastern Wood Pewee/ Contopus virens
				Cerulean Warbler/ Dendroica caerulea
				Acadian Flycatcher/ Empidonax virescens
				Summer Tanager/ Piranga rubra
				Yellow-throated Vireo/ Vireo flavifrons
			P-DIC	Cumberland Azalea/ Rhododendron cumberlandense
		Rich Soil	P-DIC	American Chestnut/ Castanea dentata
			P-MON	Spotted Coralroot/ Corallorhiza maculata
		Riparian	BIRD	American Redstart/ Setophaga ruticilla
		Rocky/Rocks	P-DIC	Wafer Ash, Hop-tree/ Ptelea trifoliata
			P-MON	Rough Dropseed/ Sporobolus clandestinus
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Sandy Soil	P-DIC	Sweet-fern/ Comptonia peregrina
				Racemed Milkwort/ Polygala polygama var. polygama
				Hairy Snout Bean/ Rhynchosia tomentosa
				American Chaffseed/ Schwalbea americana
			P-MON	Rough Dropseed/ Sporobolus clandestinus
		Shrub/Sapling Condition	BIRD	Least Flycatcher/ Empidonax minimus
				American Redstart/ Setophaga ruticilla
		Shrub/Sapling Condition	BIRD	Ovenbird/ Seiurus aurocapillus
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Slope (hillside, steepness)	BIRD	Worm-eating Warbler/ Helmitheros vermivorus
				Ovenbird/ Seiurus aurocapillus
		Snags > 6" dbh		Red-headed Woodpecker/ Melanerpes erythrocephalus
		Tract Size (Area Sensitive)		Cerulean Warbler/ Dendroica caerulea
				Acadian Flycatcher/ Empidonax virescens
				Swainson's Warbler/ Limnodynastes swainsonii
				Worm-eating Warbler/ Helmitheros vermivorus
				Ovenbird/ Seiurus aurocapillus
		Tree and Snags (Cavity Nesters)		Red-headed Woodpecker/ Melanerpes erythrocephalus
		Trees > 20" dbh		Cerulean Warbler/ Dendroica caerulea
		Upland (usually mesic to dry, not subject to holding water)		Cerulean Warbler/ Dendroica caerulea
				Ovenbird/ Seiurus aurocapillus
				Yellow-throated Vireo/ Vireo flavifrons
		Water (Distance Sensitive)		Acadian Flycatcher/ Empidonax virescens
				American Redstart/ Setophaga ruticilla
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus

Viability Assessment Report For Dry-Xeric Oak Forest Habitat Association

Prepared by
Pamela J. Martin and Sharon K. Boedy
Daniel Boone National Forest

I. Description of Habitat Association:

Dry-xeric oak forests usually occur on very dry and infertile uplands, but can also occur on steep, south-facing slopes or rock outcrops. Soils are usually coarse textured, and dry soil conditions may prevail most of the year (USDA Forest Service, 1997). Two recognized subtypes of dry-xeric oak forests occur in the South, a widespread subtype and a southern subtype. Only the widespread subtype occurs on the Daniel Boone National Forest (DBNF). Dominant species in this type include black oak, post oak, blackjack oak, chestnut oak, scarlet oak and limited white oak. Water on these sites is primarily from surface sources (rainfall). On some sites, limited amounts of ground water help maintain the sites. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the dry-xeric oak habitat association, also provides energy sources. Periodic surface fires are important for maintaining this community type. Fires are thought to have burned frequently enough to restrict tree density and promote the growth of shade intolerant grasses, forbs, and shrubs (USDA Forest Service, 1997). Lightning fires occur, but are rare. Periodic tornadoes and flooding are probably the most important natural disturbances today.

The dry-xeric oak forest is found in all the ecological provinces and sections throughout the Hot Continental Division (220). The DBNF occurs in three of these ecological sections: Interior Low Plateau and Highland Rim (222E), Cumberland Mountains (M221C) and Northern Cumberland Plateau (221H). Dry-xeric oak habitat occurs in all three of these ecological sections. On the DBNF, Interior Low Plateau and Highland Rim, dry-xeric oak habitat occurs in the following landtype associations (LTAs) (USDA Forest Service, 1997a; 1996)

- Triplett Creek Knobs (222En002)
- Knob Flats (222En001) Land Type Association.

In the Cumberland Mountain ecological section of the DBNF, dry-xeric oak habitat occurs in the following LTAs (USDA Forest Service, 1997a; 1996):

- Northern Jellico Mountains (M221Cd001).

The majority of the dry xeric oak habitat on the DBNF occurs in the Northern Cumberland Plateau ecological province. In the Northern Cumberland Plateau, dry-xeric oak habitat occurs in the following LTAs (USDA Forest Service, 1997a; 1996):

- Northern Cliff / Karst (221Hb006)
- Northern Escarpment (221Hb004)
- Northern Low Hills / Cliff Transition (221Hb005)
- Central Knobstone Escarpment (221Hb001)
- Northern Rolling Hills (221He003)
- North Fork Kentucky Cliffs (221Hb003)
- Central Cliff (221Hb002)
- Southern Knobstone Escarpment (221He001)
- London-Corbin Plain Transition (221Hc007)
- Rockcastle Hills (221Hc005)
- London-Corbin Plain (221Hc006)
- Southern Cliff (221Hc003)
- Big South Fork Plateau (221Hc004)
- Low Hills (221He002)
- Low Hills / Rugged Hills Transition (221Ha002)
- Southern Middle Breathitt Rugged Hills (221Ha001).

On the DBNF, this forest type typically occupies ridges between the clifftops with pine, on Dekalb and Hartsells soils derived from sandstone or on Gilpin and Whitley soils derived from sandstone and shale. It is also widespread on drier Trappist soils derived from Devonian black shale. On the DBNF, typical dominant species in this habitat association are chestnut oak and scarlet oak. In successional stands, there appears to be a general trend from pine species to scarlet oak to chestnut oak. Other frequent trees, especially in the understory, include white pine, black gum and red maple. Frequent small tree and shrub species include sourwood, mountain laurel, blueberry, and rhododendron. In moister transitions, American holly, big leaf magnolia and devil's walking stick are found in this habitat association. Herb cover is largely restricted to openings or on better soils with less undergrowth of ericaceous species and includes ground pine, spotted wintergreen, whorled loosestrife, butterfly pea, dwarf cinquefoil, dittany, foxglove, angelica, Maryland golden aster, sweet goldenrod, wavy leaf aster, pink lady's slipper and rattlesnake plantain (USDA Forest Service et al, 1989).

II. Current Status of the Habitat Association on the Daniel Boone National Forest

The dry-xeric oak forest types on the DBNF are tracked in the Continuous Inventory of Stand Conditions (CISC) and are represented as chestnut oak (52), scarlet oak (59), and chestnut oak - scarlet oak (60). The management codes in this forest type, dry-xeric oak, are defined as follows:

(52) – 70+ percent of the dominant and co-dominant basal area is hardwood, and 50+ percent is chestnut oak;

(59) – 70+ percent of the dominant and co-dominant basal area is hardwood, and 50+ percent is scarlet oak, and

(60) – 70+ percent of the dominant and co-dominant basal area is hardwood, and 50+ percent of chestnut oak and scarlet oak (USDA Forest Service, 1992).

On the DBNF, approximately 665,000 acres are in forested land. Of this acreage, approximately 6 percent or 39,856 acres are within the dry-xeric oak forest type, as described. Utilizing the CISC database, the dry-xeric oak forest type occurring on the Daniel Boone National Forest was further divided to represent age and acres (USDA Forest Service, 1998).

Table 1. Dry-xeric oak forest type represented by age and acres.

AGE	ACRES		AGE	ACRES	
0-10	2,942		81-90	8,846	
11-20	949		91-100	4,646	
21-30	326		101-110	1,859	
31-40	233		111-120	557	
41-50	329		121-130	32	
51-60	1,130		131-140	108	
61-70	8,326				
71-80	9,973			TOTAL	39,856

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The desired future condition for this habitat association would be to provide amounts of suitable habitat in the proper stages of succession to ensure that the species dependant on the association have a high probability of persistence on the forest. This would involve maintaining a structured age class distribution with emphasis on maintaining a significant component of habitat that contains the habitat modifiers required by various species.

- Evaluate habitats to determine those capable of supporting reintroduction of species at risk.

- *Rationale: Specific species management within this habitat association may require reintroduction efforts to ensure continued persistence of that particular species or group of species in this association.*
- Dry-xeric oak types need to be represented in a range of age classes.
 - *Rationale: Dry-xeric oak makes up approximately 6 percent of the forest type on the DBNF. The species identified in this habitat association require a variety of age classes, elevations and tract sizes. A range of age classes, along with their accompanying attributes, is a necessary component of this habitat association. Age distribution management along with implementation of best management practices should ensure continued persistence of the species identified in this habitat association.*
- Where applicable, leave project unit boundaries with irregular and feathered edges.
 - *Rationale: Abrupt habitat changes can create barriers to wildlife passing through the unit.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

Monitoring and inventory of the Dry-Xeric Oak Habitat Association will need to be implemented at a level sufficient to provide data to track the current condition of the habitat. The following items are considered necessary to ensure that the association can be properly evaluated and decisions supported.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 years. Stand (or analysis unit) inventory should also be conducted in response to events that have potential to alter the landscape i.e., windstorms, winter storms, and infestations (high priority).
 - *Rationale: Inventory to identify and update baseline data or assess changed conditions after non-prescribed major disturbances. Inventory may be at the stand level or larger units may be used (such as ecological or habitat units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*
- Employ GIS and vegetation management databases to track the condition and composition of the Dry-Xeric Oak Habitat Association (high priority).
 - *Rationale: The use of FSVeg (CISC or best available science) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the pine habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers.*

- Continue to implement R8 landbird monitoring program (high priority).
 - *Rationale: This monitoring program will help track the persistence of the avian species in this habitat association. This may be a critical element in documenting avian species trends in this association. This monitoring program contains points linked to this association it would be considered an excellent tool for both species-specific and association monitoring.*

References:

- USDA Forest Service, 1992. Southern Region. Silvicultural examination and prescription field book. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA.
- USDA Forest Service. 1996. Landtype association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1997. Guidance for conserving and restoring old-growth forest communities on National Forests in the Southern Region: report of the Region 8 old-growth team. Forestry Report R8-FR 62. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA. 117 pp.
- USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 1998. Continuous inventory of stand condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1989. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stanton Ranger District. Winchester, KY. 316 pp.

Attachment A.

Species List: Dry-Xeric Oak Habitat Association

Class	Common/Species
ANIMALS	
Birds	Eastern Wood Pewee/ <i>Contopus virens</i> Cerulean Warbler/ <i>Dendroica caerulea</i> Least Flycatcher/ <i>Empidonax minimus</i> Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i> Summer Tanager/ <i>Piranga rubra</i> Ovenbird/ <i>Seiurus aurocapillus</i>
Insects	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i> Regal Fritillary/ <i>Speyeria idalia</i>
PLANTS	
Dicots	American Chestnut/ <i>Castanea dentata</i> Chinquapin (generic)/ <i>Castanea pumila</i> Allegheny Chinquapin/ <i>Castanea pumila</i> var. <i>pumila</i> American Cow-wheat/ <i>Melampyrum lineare</i> Cumberland Azalea/ <i>Rhododendron cumberlandense</i> Hairy Snout Bean/ <i>Rhynchosia tomentosa</i> American Chaffseed/ <i>Schwalbea americana</i> Spiked Hoary-pea/ <i>Tephrosia spicata</i> Cutleaf Meadow Parsnip/ <i>Thaspium pinnatifidum</i> Velvet Bush Pea (generic)/ <i>Thermopsis mollis</i> Velvet Bush Pea/ <i>Thermopsis mollis</i> var. <i>mollis</i>
Monocots	Pink Lady's-slipper/ <i>Cypripedium acaule</i> Bearded Skeleton Grass/ <i>Gymnopogon ambiguus</i> Wood Lily/ <i>Lilium philadelphicum</i> var. <i>philadelphicum</i> Rough Dropseed/ <i>Sporobolus clandestinus</i>
Mosses	Dog Paw Moss, Elegant Moss/ <i>Dicranum scoparium</i>

Attachment B.

Dry-Xeric Oak Forest Species/Habitat Relationships with References

ANIMALS

Birds

Eastern Wood Pewee – *Contopus virens* – This species preferred habitat is rather open mature woodland in a rather dry situation (Hamel, 1992). This species may be absent from younger, second growth forest where an open midstory has not yet developed. In such habitat they often frequent edges and road or stream corridors (Palmer-Ball, 1996). They typically utilize large deciduous trees for the nest site but may use conifers in mixed forest types. This species may be found in numbers in most major forest types examined in Kentucky (Mengel, 1965). The eastern wood pewee would be attracted to the more open, dry conditions that are characteristic of dry-xeric oak forests and would be attracted to the dominance of hardwoods for nesting.

Cerulean Warbler – *Dendroica caerulea* – This species would be primarily attracted to the hardwood component of mixed pine-oak stands. Cerulean Warblers depend primarily on extensive tracts of mature, relatively undisturbed, deciduous forest. These birds occur in floodplains and upland sites that have large trees (> 20" dbh) in which to nest. Both nesting and foraging take place in the canopies of hardwoods. Stands are usually somewhat open, with little understory; however, according to Buehler and Nicholson, monitoring data suggest that breeding territories in the Cumberland Mountains tend to have fewer canopy trees and greater shrub coverage than those elsewhere (1997). The birds are rarely found in tracts less than 250 hectares, whereas maximum population densities occur in tracts greater than 3000 ha (Buehler and Nicholson 1997). Hamel gives a minimum tract size of 1750 ha (1992). The cerulean warbler would be attracted to the dominance of hardwoods and the more open, dry conditions that are characteristic of dry-xeric oak forests.

Least Flycatcher – *Empidonax minimus* – This is a species of open conditions; it is rarely encountered deep in the forest. Open, deciduous woods (particularly those that have been disturbed by burning or logging), forest edge, fields with scattered large trees, and other habitats that provide early successional conditions are utilized. During spring migration, Mengel observed male birds in alders and willows in a marshy, Laurel County meadow (1965). Most of the breeding population frequents elevations above 2500 feet. The least flycatcher would be attracted primarily to the hardwood component of this forest and the more open conditions that usually predominate in the dry-xeric sites.

Red-headed Woodpecker – *Melanerpes erythrocephalus* – Semi-open to open habitat with an abundance of large (> 14" dbh), dead trees is preferred for both breeding and wintering purposes. Relatively open, mature woods, swamps, clearings within mixed woodland, forest edges, and places where groves of trees are present, such as park-like settings, are commonly used. On the DBNF, the birds are often observed in pine-dominated stands that have been frequently burned (L. Perry, pers. obs.). Nesting is in dead trees, or in dead limbs of live trees (Mengel 1965). This species generally avoids mature closed canopy forest during the breeding season (Palmer-Ball

1996). The red-headed woodpecker would be attracted to the more open, dry conditions that are characteristic of dry-xeric oak forests and would be attracted to the presence of oaks for foraging.

Summer Tanager – *Piranga rubra* – Relatively dry sites, which tend to produce stands of a semi-open condition, are frequented by this species. Uplands are commonly used, but the birds may occur in a variety of habitats, including bottomlands and wooded residential areas. Forest types range from hardwood to pine-hardwood stands of open to medium density. On the DBNF, the birds are frequently found in mature, mixed pine stands that have been burned and undergone midstory removal (L. Perry, pers. obs.). Oaks are often chosen for nesting, in open woodland or forest edge and often over open spaces such as roads and clearings (Mengel 1965). The summer tanager would be expected to occur in this habitat association primarily due to the more open conditions that generally prevail in dry-xeric sites and also would be attracted to the oak component of these forests for nesting.

Ovenbird – *Seiurus aurocapillus* – Mature and second growth forest conditions are utilized, on dry to moderately moist sites with light to moderate understory. Birds are more common in stands with closed canopies and open ground—This is a ground nesting species that forages in the leaf litter or on the soil. Mengel observed nests on logging roads and under small logs, sheltered by ferns, on steep, mesophytic slopes (1965); however, Baker and Lacki note that birds are more abundant in non-harvested than in harvested areas (1997). Upland stands and sloping terrain are preferred, but a variety of deciduous and mixed (e.g., pine-oak) forest types are used. This is a forest interior species having a minimum necessary tract size of 15 ha (Hamel 1992). The ovenbird would be attracted to the dominance of deciduous trees and more open ground conditions that are typical of dry-xeric oak forests.

Insects

Appalachian Grizzled Skipper – *Pyrgus wyandot* – In Kentucky, *Pyrgus wyandot* is only known from eastern shale barrens in Harlan County. Elsewhere it is known to occur in open areas near woods, including valley bottoms, barrens, meadows, grassy hillsides and scrub oak openings. Its food sources include wild strawberry, Canadian cinquefoil, blueberry, and plants belonging to the rose family.

Regal Fritillary – *Speyeria spedia* – This butterfly was once considered common in the natural grasslands, pastures and wet meadows of the northeastern United States. In the mid-west, fire-maintained oak-pine barrens supplied significant amounts of habitat for the Regal Fritillary. Food sources include violets, milkweeds, thistles, and other nectar producers. This species is now considered to be extirpated from Kentucky.

PLANTS

Dicots

American Chestnut - *Castanea dentata* – American chestnut is far less common today than it once was. A fungal disease introduced from Asia in 1904 decimated the species in about 30 years. The species sprouts prolifically and sprouts are still found through its range. American chestnut once dominated much of what is now upland oak forest. On what is now Daniel Boone

National Forest land, American chestnut was found on narrow sandstone and conglomerate ridges along the edge of the escarpment and in the Redbird area. It was associated with chestnut oak. Scarlet and black oaks replaced it on these sites. Today on the Daniel Boone National Forest, sprouts are common to scarce on upper slopes and ridges near the escarpment and on portions of the Redbird District. The species grows on acid soils that are generally poor, dry, and located on sites subject to fire. It is believed that fire promoted the species.

Allegheny Chinquapin – *Castanea pumila* var. *pumila* – This tree is found in dry upland oak or oak-yellow pine forests. It usually occurs where midstory and shrub layers are sparse, or the canopy is open. The species at least somewhat adapted to fire, sprouting readily after fire. It may respond to fire in the way American chestnut and oaks do.

American Cow-wheat – *Melampyrum lineare* (generic) – The taxonomy of American Cow-wheat is somewhat confused with numerous uses by various authors. Following Medley (1993), only the var. *pectinatum* is likely to present on the DBNF. Specimens not identified to variety from the DBNF area are assumed to be this variety. Habitat details are described below for the variety.

Cumberland Azalea – *Rhododendron cumberlandense* – This azalea is restricted to the central Appalachian Mountains. It grows in open oak and oak-yellow pine forest, usually on dry, rocky slopes or ridges. It usually occurs as scattered individuals, but may form small clumps. The DBNF populations are in the same habitat. Most occurrences are in the Jellicos and on the Redbird District.

American Chaffseed – *Schwalbea americana* – This plant occurs in two general kinds of habitats, wet and dry. In all cases, soils are sandy and somewhat sterile. In wet habitats, the combination of constant water and periodic fire maintain the site in an open condition. The overstory is open as are the midstory and shrub layers beneath it. Generally wet sites are grassy with few shrubs. Periodic fire helps to maintain the open condition of the sites. It also plays a role in triggering flowering. This habitat type is not known from the DBNF. Dry habitats likewise are open with a thin overstory and open midstory and shrub layers. These sites are generally a mixture of forbs, grasses, and low shrubs. Some dry habitats are subjected to periodic burns, which help to maintain the open condition. Fire here also helps to trigger flowering. In other dry habitats, the openness is more edaphically controlled. The historic sites on the DBNF fall into this group. Here fire would have triggered flowering. Other dry DBNF sites could, with periodic fire, support *Schwalbea* populations.

Hairy Snout Bean – *Rhynchosia tomentosa* (var. *tomentosa*) – The hairy snout bean is found throughout most of the southeastern US. It grows in dry, open, often sandy, oak or yellow pine forest, at forest margins, in sandhills, and occasionally in mesic forest. The DBNF sites are all in warm season grassland, or low disturbed vegetation along roads or under powerline rights-of-way.

Spiked Hoary-pea – *Tephrosia spicata* – This plant is a southern species with a number of more northern stations. It is commonly found in dry to wet, open yellow pine or yellow pine-hardwood forest, roadsides, clearings and fields. On the DBNF, the species is found on boulder/cobble bars along larger streams and rivers of the Cumberland River drainage. A few

sites are known from sandy, sparsely shaded openings on ridges.

Cutleaf Meadow Parsnip – *Thaspium pinnatifidum* – The cutleaf meadow parsnip is associated throughout its range with calcareous bedrock including limestone, siltstone, and dolomite. It is a species of moderately shaded forestland. On the DBNF, it is found in open oak or oak-cedar forest on limestone and calcareous siltstone on the Morehead District.

Velvet Bush Pea – *Thermopsis mollis* (generic) – The velvet bush pea exists as two varieties, a piedmont variety discussed below, which is found on in Kentucky, and a montaine variety. The latter occurs in dry-mesic forest on slopes and ridges.

Velvet Bush Pea – *Thermopsis mollis* var. *mollis* – This variety is a Piedmont species that occurs in the mountains and coastal plain as well. It grows on sandy slopes and in dry oak or oak-yellow pine forest usually on ridges. The DBNF sites, the only Kentucky locations, are on broad, sandy ridges in dry-xeric to dry-mesic oak forest. The species only flowers in open areas such as along roads or in tree gaps. It has been observed to form dense patches on disturbed sandy ground. The rhizome is stout and several inches below the surface, suggesting along with the habitat, that fire is beneficial for the species.

Monocots

Pink Lady's-slipper – *Cypripedium acaule* – This orchid occurs in acid forests or wetlands (usually sphagnum bogs). On the DBNF, pink lady-slipper is found in upland oak and mixed pine-oak woods, and occasionally on hummocks within seeps and streamhead wetlands. It occurs in light to heavy shade, but does not seem to flower unless in somewhat open conditions. This species responds well to burning. It is not uncommon to find 3-dozen plants in flower and as many more in vegetation condition following a fire where only a dozen or so were found before. The species is experiencing collection pressure from root diggers. Digging of this species is not permitted on the DBNF.

Bearded Skeleton Grass – *Gymnopogon ambiguous* – Bearded skeleton grass is a coastal plain species that generally occurs in dry, sandy, open forest. It may also occur in open grassland. On the DBNF, it occurs in open warm season grassland and open, sandy ground with or without light forest cover.

Wood Lily – *Lilium philadelphicum* var. *philadelphicum* – This plant occurs from New England to NC and Kentucky. It is found in open, usually dry forest or in open fields or warm season grass areas. On the DBNF, it is know from open yellow pine-oak forest, roadsides, warm season grassland, and old fields. It requires open conditions and is soon choked out by heavy cover of herbaceous or woody species. Fire maintains its habitat and promotes the plant.

Rough Dropseed – *Sporobolus clandestinus* – Rough dropseed is tall grass prairie species, which also occurs on the coastal plain. It is found in dry sandy soil of prairies, openings, barrens, and along roadways and other rights-of-way. On the DBNF, the species is found in McCreary and Pulaski Counties on limestone cliffs and open, sandy yellow pine or yellow pine-oak forest.

Mosses

Dog Paw or Elegant Moss – *Dicranum scoparium* – is found throughout most of eastern North America. It is relatively common on shaded sandstone boulders, outcrops and cliffs. It also occurs on soil in upland forest. It appears to require moderate shade and acid conditions, but will live in moist to dry environments. The species is often subject to fire and frequently portions of clumps are burned, but not the entire clump. The species is collected for the horticultural industry. It may serve as a refugium for some species during fire events, and act as water reservoir and soil stabilizer following fire.

References:

- Baker, M.D. and Michael J. Lacki. 1997. Short-term changes in bird communities in response to silvicultural prescriptions. *Forest Ecology and Management* 96 (1997) 27-36.
- Buehler, D.A., and C.P. Nicholson. 1997. Ecology of the Cerulean Warbler in the Cumberland Mountains and the Southern Appalachians. 1996 Annual Report. Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.
- Hamel, Paul B. 1992. Land manager's guide to birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Medley, M.E. 1993. An annotated catalog of the known or reported vascular flora of Kentucky. Unpublished dissertation. University of Louisville. [A reset, reduced type copy from TNC/KSNPC].
- Mengel, R.M. 1965. The birds of Kentucky. *Ornithological Monographs* No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581pp.
- Palmer-Ball, B.L. 1996. The Kentucky breeding bird atlas. The University Press of Kentucky, Lexington, KY. 372pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.

07/15/2003

Attachment C.

Dry-Xeric Oak Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
5-Dry-Xeric Oak	Dry-Xeric Oak Forest	(blank)	INSEC	Regal Fritillary/ Speyeria idalia
			P-DIC	Cow-wheat/ Melampyrum lineare
		Acidic Substrate		Velvet Bushpea/ Thermopsis mollis var. mollis
			P-MOS	Dog Paw Moss, Elegant Moss/ Dicranum scoparium
		Basic Substrate	P-DIC	Cutleaf Meadow-parsnip/ Thaspium pinnatifidum
		Drainage Good	INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
				Regal Fritillary/ Speyeria idalia
		Dry	BIRD	Summer Tanager/ Piranga rubra
			P-DIC	Spiked Hoary-pea/ Tephrosia spicata
			P-MON	Pink Lady-slipper/ Cypripedium acaule
				Bearded Skeleton Grass/ Gymnopogon ambiguus
				Rough Dropseed/ Sporobolus clandestinus
		Elevation (above 2300 ft)	BIRD	Least Flycatcher/ Empidonax minimus
		Fire Tolerant/Enhanced		Least Flycatcher/ Empidonax minimus
				Red-headed Woodpecker/ Melanerpes erythrocephalus
			INSEC	Regal Fritillary/ Speyeria idalia
		Forb/Grass Condition		Regal Fritillary/ Speyeria idalia
			P-DIC	Velvet Bushpea/ Thermopsis mollis var. mollis
		Mature forest	BIRD	Cerulean Warbler/ Dendroica caerulea
				Red-headed Woodpecker/ Melanerpes erythrocephalus
		Mid-age Forest		Ovenbird/ Seiurus aurocapillus
		Moderate Shade	P-MON	Wood Lily/ Liliun philadelphicum var. philadelphicum
		Open (Little or No Shade)	BIRD	Summer Tanager/ Piranga rubra
			INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
				Regal Fritillary/ Speyeria idalia
			P-DIC	Velvet Bush Pea/ Thermopsis mollis (generic)
			P-MON	Pink Lady-slipper/ Cypripedium acaule
			P-MOS	Dog Paw Moss, Elegant Moss/ Dicranum scoparium
		Open Forest Canopy	BIRD	Least Flycatcher/ Empidonax minimus
				Red-headed Woodpecker/ Melanerpes erythrocephalus
				Summer Tanager/ Piranga rubra
			P-DIC	American Chestnut/ Castanea dentata
				Chinquapin (generic)/ Castanea pumila
				Allegheny Chinquapin/ Castanea pumila var. pumila
				Cutleaf Meadow-parsnip/ Thaspium pinnatifidum
				Velvet Bush Pea/ Thermopsis mollis (generic)
		Open Midstory/Understory	BIRD	Summer Tanager/ Piranga rubra
			P-DIC	Cumberland Azalea/ Rhododendron cumberlandense

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
		Rocky/Rocks	P-MON	Rough Dropseed/ Sporobolus clandestinus
		Sandy Soil	INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
				Regal Fritillary/ Speyeria idalia
			P-DIC	Hairy Snout Bean/ Rhynchosia tomentosa
				American Chaffseed/ Schwalbea americana
			P-MON	Rough Dropseed/ Sporobolus clandestinus
		Shrub/Sapling Condition	BIRD	Least Flycatcher/ Empidonax minimus
			INSEC	Regal Fritillary/ Speyeria idalia
		Snags > 6" dbh	BIRD	Red-headed Woodpecker/ Melanerpes erythrocephalus
		Tree and Snags (Cavity Nesters)		Red-headed Woodpecker/ Melanerpes erythrocephalus
		Upland (usually mesic to dry, not subject to holding water)		Cerulean Warbler/ Dendroica caerulea

Viability Assessment Report For Dry-Xeric Cedar-Oak Forest Habitat Association

Prepared by
Pamela J. Martin and Sharon K. Boedy
Daniel Boone National Forest

I. Description of Habitat Association:

Eastern redcedar is among the first woody species to invade abandoned fields and areas cleared. Eastern redcedar grows best on deep, moist, well-drained bottomland alluvial sites, but rarely becomes dominant because it is quickly superseded by such species as persimmon, sassafras and other species. On drier sites, succession to hardwoods slowly occurs, often over a few hundred years. Overall, eastern redcedar is considered temporary and is eventually succeeded by various hardwood types (Eyre, 1980). The Dry-Xeric Cedar-Oak Habitat Association is identified by the occurrence of eastern redcedar and associates, which occur on level to gently rolling valley topography over limestone or dolomite parent material at low elevations over much of the range of the species (SAMAB, 1996). On the Daniel Boone National Forest (DBNF) and the Cumberland Plateau, eastern redcedar occurs in similar places, but also occurs on dry to xeric, rocky, limestone, dolomite, or calcareous siltstone cliffs, slopes, and flats. These sites may occur at higher elevations and are more natural than the widespread old field eastern redcedar thickets, and are the subject of this report. The dry-xeric eastern redcedar communities grade into xeric oak communities on many sites. The DBNF occurs in three ecological sections: Interior Low Plateau and Highland Rim (222E), Cumberland Mountains (M221C) and Northern Cumberland Plateau (221H). On the DBNF, dry-xeric cedar-oak habitat occurs in the following landtype associations (LTAs) (see USDA Forest Service, 1997a; 1996):

- Southern Knobstone Escarpment (221Hc001)
- Central Cliff (221Hb002)
- Northern Escarpment (221Hb004).

On the DBNF, eastern redcedar appears to be a stable climax dominant only in a narrow zone above dry limestone cliffs, on Fredonia soils mixed with outcrops. Water on these sites is primarily from surface sources (rainfall). On some sites, limited amounts of ground water help maintain the sites. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the Dry-Xeric Cedar-Oak Habitat Association, also provides energy sources. Frequently associated small trees and shrubs include persimmon, hackberry, Carolina buckthorn, hoptree, shrubby St. John's wort, Carolina rose, downy junberry, and rusty blackhaw. Typical herbaceous species include purple cliffbrake, wall rue, golden alexanders, houstonia, false goldenrod and smooth aster. Eastern redcedar habitat transitions into oak forest types above the steepest slopes, either on

more deeply weathered limestone, on old sandy terraces, or on less calcareous bedrock. Dominants include white oak, chinquapin oak, black oak and shumard oak. Hornbeam is often dominant in the understory, with occurrences of redbud. Other woody species that have been observed on dry-xeric cedar-oak sites are sugar maple, blue ash, slippery elm and shagbark hickory. Herbaceous species include woolly blue violet, smooth rock cress, alum root, downy wood mint, mullein foxglove, round leaved ragwort, elm leaved goldenrod and Short's aster (USDA Forest Service et al., 1988).

II. Current Status of the Habitat Association on the Daniel Boone National Forest

The dry-xeric cedar-oak forest types on the Daniel Boone National Forest are tracked in the Continuous Inventory of Stand Conditions (CISC) and are represented as eastern redcedar (35), eastern redcedar/ hardwood (11), and oak/ eastern redcedar (43). The management codes in this forest type, dry-xeric cedar-oak, are defined as follows (USDA Forest Service, 1992)

(35) = 70+ percent of the dominant and co-dominant basal area is softwood, and 50+ percent is eastern redcedar;

(11) = 50 to 69 percent of the dominant and co-dominant basal area is softwood, the plurality of which is eastern redcedar;

(43) = 30 to 49 percent of the dominant and co-dominant basal area is softwood, the plurality of which is eastern redcedar.

On the DBNF, approximately 665,000 acres are in forested land. Of this acreage, approximately less than 1 percent or 88 acres have been identified as the dry-xeric cedar-oak forest type as described. Utilizing the CISC database, the dry-xeric cedar-oak forest type on the Daniel Boone National Forest was further divided by age and acres (USDA Forest Service, 1998).

Table 1. Dry-xeric cedar-oak forest types by age and acres.

AGE	ACRES
0-40	0
41-50	10
51-60	31
61-70	10
71-80	10
81-90	6
91-100	21
TOTAL	88

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The desired future condition for this habitat association would be to provide amounts of suitable habitat in the proper stages of succession to ensure that the species dependant on the association have a high probability of persistence on the forest. This would involve maintaining a structured age class distribution with emphasis on maintaining a significant component of habitat that contains the habitat modifiers required by various species.

- Dry-xeric cedar-oak types need to be represented on the DBNF.
 - *Rationale: Dry-xeric cedar-oak makes up less than 1 percent of the forest type on the DBNF. The species identified in this habitat association require a variety of attributes. A range of age classes, along with their accompanying attributes, is a necessary component of this habitat association. Age distribution management along with implementation of best management practices should ensure continued persistence of the species identified in this habitat association.*
- Where applicable, leave project unit boundaries with irregular and feathered edges.
 - *Rationale: Abrupt habitat changes can create barriers to wildlife passing through the unit.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

Monitoring and inventory of the Dry-Xeric Cedar-Oak Habitat Association will need to be implemented at a level sufficient to provide data to track the current condition of the habitat. The following items are considered necessary to ensure that the association can be properly evaluated and decisions supported.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 years. Stand (or analysis unit) inventory should also be conducted in response to events that have potential to alter the landscape i.e., windstorms, winter storms, insect and/or disease infestations (high priority).
 - *Rationale: Inventory to identify and update baseline data or assess changed conditions after non-prescribed major disturbances. Inventory may be at the stand level or larger units may be used (such as ecological or habitat units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*
- Employ GIS and vegetation management databases to track the condition and composition of the Dry-Xeric Cedar-Oak Habitat Association (high priority).

- *Rationale: The use of FSVeg (CISC or best available science) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the pine habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers.*
- Continue to implement R8 landbird monitoring program (high priority).
 - *Rationale: This monitoring program will help track the persistence of the avian species in this habitat association. This may be a critical element in documenting avian species trends in this association. This monitoring program contains points linked to this association it would be considered an excellent tool for both species-specific and association monitoring.*

References:

- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters. Washington, DC. 149 pp.
- Lawson, E.R. 1990. "Eastern Redcedar" in: Silvics of North America [online]. Ag. Handbook 654. Burns, R.M. and B.H. Honkala, tech. coords. Available: http://www.na.fs.fed.us/spfo/fth_pub.htm. U. S. Department of Agriculture, Forest Service. Washington, DC. Accessed September 14, 2001.
- SAMAB, Southern Appalachian Man and the Biosphere. 1996. The Southern Appalachian Assessment Terrestrial Technical Report. Report 5 of 5. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta, GA.
- USDA Forest Service, 1992. Southern Region. Silvicultural Examination and Prescription Field Book. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA.
- USDA Forest Service. 1996. Landtype association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1997. Guidance for conserving and restoring old growth forest communities on National Forest in the Southern Region. Report of the Region 8 Old Growth Team. Forestry Report R8-FR 62. Atlanta, GA. 117 pp.
- USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 1998. Continuous Inventory of Stand Condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

07/15/2003

USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1988. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Somerset Ranger District. Winchester, KY. 245 pp.

07/15/2003

Attachment A.

Species List: Dry-Xeric Cedar-Oak Habitat Association

Class	Common Name/ Species
ANIMALS	
Bird	Eastern Wood Pewee/ <i>Contopus virens</i> Cerulean Warbler/ <i>Dendroica caerulea</i> Least Flycatcher/ <i>Empidonax minimus</i> Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i> Summer Tanager/ <i>Piranga rubra</i> Ovenbird/ <i>Seiurus aurocapillus</i>
Gastropods	Pupillids/ Pupillidae
PLANTS	
Dicots	Mountain-lover/ <i>Paxistima canbyi</i> Nettle-leaf Sage/ <i>Salvia urticifolia</i> Cutleaf Meadow Parsnip/ <i>Thaspium pinnatifidum</i>
Gymnosperms	Eastern Redcedar/ <i>Juniperus virginiana</i> var. <i>virginiana</i>
Monocots	Juniper Sedge/ <i>Carex juniperorum</i> Purple Caric Sedge/ <i>Carex purpurifera</i>

Attachment B.

Dry-Xeric Cedar-Oak Forest Species/Habitat Relationships with References

ANIMALS

Birds

Eastern Wood Pewee – *Contopus virens* – This species preferred habitat is rather open mature woodland in a rather dry situation (Hamel, 1992). This species may be absent from younger, second growth forest where an open midstory has not yet developed. In such habitat they often frequent edges and road or stream corridors (Palmer-Ball, 1996). They typically utilize large deciduous trees for the nest site but may use conifers in mixed forest types. This species may be found in numbers in most major forest types examined in Kentucky (Mengel, 1965). Eastern wood pewees would be primarily attracted to the open character frequently associated with dry-xeric cedar-oak stands and would be particularly attracted by the hardwood (oak) component of these forests.

Cerulean Warbler – *Dendroica caerulea* – Cerulean warblers depend primarily on extensive tracts of mature, relatively undisturbed, deciduous forest. These birds occur in floodplains and upland sites that have large trees (> 20" dbh) in which to nest. Both nesting and foraging take place in the canopies of hardwoods. Stands are usually somewhat open, with little understory; however, according to Buehler and Nicholson, monitoring data suggest that breeding territories in the Cumberland Mountains tend to have fewer canopy trees and greater shrub coverage than those elsewhere (1997). The birds are rarely found in tracts less than 250 hectares, whereas maximum population densities occur in tracts greater than 3000 ha (Buehler and Nicholson 1997). Hamel gives a minimum tract size of 1750 ha (1992). Cerulean warblers would be primarily attracted to the open character frequently associated with dry-xeric cedar-oak stands and would be particularly attracted by the hardwood component of these forests.

Least Flycatcher – *Empidonax minimus* – This is a species of open conditions; it is rarely encountered deep in the forest. Open, deciduous woods (particularly those that have been disturbed by burning or logging), forest edge, fields with scattered large trees, and other habitats that provide early successional conditions are utilized. During spring migration, Mengel observed male birds in alders and willows in a marshy, Laurel County meadow (1965). Most of the breeding population frequents elevations above 2500 feet. Least flycatchers would be primarily attracted to the open character frequently associated with dry-xeric cedar-oak stands and would be particularly attracted by the hardwood component of these forests.

Red-headed Woodpecker – *Melanerpes erythrocephalus* – Semi-open to open habitat with an abundance of large (> 14" dbh), dead trees is preferred for both breeding and wintering purposes. Relatively open, mature woods, swamps, clearings within mixed woodland, forest edges, and places where groves of trees are present, such as park-like settings, are commonly used. On the DBNF, the birds are often observed in pine-dominated stands that have been frequently burned (L. Perry, pers. obs.). Nesting is in dead trees, or in dead limbs of live trees (Mengel 1965). This species generally avoids mature closed canopy forest during the breeding season (Palmer-Ball 1996). Red-headed woodpeckers would be primarily attracted to the open character frequently

associated with dry-xeric cedar-oak stands and would also utilize the oak component of these forests for food.

Summer Tanager – *Piranga rubra* – Relatively dry sites, which tend to produce stands of a semi-open condition, are frequented by this species. Uplands are commonly used, but the birds may occur in a variety of habitats, including bottomlands and wooded residential areas. Forest types range from hardwood to pine-hardwood stands of open to medium density. On the DBNF, the birds are frequently found in mature, mixed pine stands that have been burned and undergone midstory removal (L. Perry, pers. obs.). Oaks are often chosen for nesting, in open woodland or forest edge and often over open spaces such as roads and clearings (Mengel 1965) and therefore, summer tanagers would be primarily attracted to the oak component of this habitat association.

Ovenbird – *Seiurus aurocapillus* – Mature and second growth forest conditions are utilized, on dry to moderately moist sites with light to moderate understory. Birds are more common in stands with closed canopies and open ground—This is a ground nesting species that forages in the leaf litter or on the soil. Mengel observed nests on logging roads and under small logs, sheltered by ferns, on steep, mesophytic slopes (1965); however, Baker and Lacki note that birds are more abundant in non-harvested than in harvested areas (1997). Upland stands and sloping terrain are preferred, but a variety of deciduous and mixed (e.g., pine-oak) forest types are used. This is a forest interior species having a minimum necessary tract size of 15 ha (Hamel 1992). Ovenbirds would be primarily attracted to the oak component of this habitat association as well as the dry-xeric conditions and sapling understory that is often found in cedar-oak stands.

Gastropods

Pupillids- The family Pupillidae contains a group of small (less than ¼ in.) snails. On the Daniel Boone, these snails are most often found in open limestone areas such as cedar glades. This group appears to require sunlight and individuals can often be found in thin leaf litter, the bare areas at the base of cedar trees, on bare rock, or within the fine soil or moss mats that covers these exposed areas.

PLANTS

Dicots

Mountain-lover -*Paxistima canbyi* – This plant is an Appalachian provinces species that occurs on thin soils associated with limestone (or other calcareous) cliffs. These sites are usually with a hundred feet or so from the cliff edge, are dry, and tend to have a southerly (SE to NW) aspect. The sites often have a closed canopy, but the midstory and shrub layers are thin and open. It rarely is found in old fields. At one site observed on private land, the cutting of the overstory (usually eastern red cedar, *Juniperus virginiana* and oak species, *Quercus* spp.) resulted in a thick coppice of tree and shrub species. Over a two-year period, the *Paxistima* population was nearly eliminated. The species is probably not tolerant of fire.

Nettle-leaf Sage – *Salvia urticifolia* – The nettle-leaf sage is a species of the central and southern Appalachians. It grows in dry-mesic forest or shrubby areas. The DBNF sites are in open, dry oak woods on limestone.

Cutleaf Meadow Parsnip – *Thaspium pinnatifidum* – Throughout its range, this plant is associated with calcareous bedrock including limestone, siltstone, and dolomite. It is a species of moderately shaded forestland. On the DBNF, it is found in open oak or oak-cedar forest on limestone and calcareous siltstone on the Morehead District.

Gymnosperms

Eastern Redcedar – *Juniperus virginiana* var. *virginiana* – This tree is known from eastern and central North America. It is abundant in some areas, and often dominant on old fields, especially those on basic substrates. In Kentucky, it is widespread and not rare, but in most cases, it occurs as a pioneer species following extensive, and often long-term disturbance. On the Forest, most eastern redcedar occurs in more natural situations along dry limestone cliffs and flats, and rocky flats, and on dry, rocky siltstone flats. In this habitat, the species is uncommon to rare on the DBNF, and it is here that concerns for the species exist.

Monocots

Juniper Sedge – *Carex juniperorum* – Juniper sedge is known only from a few areas, but in a range extending from Ontario, Canada to Kentucky. In the US, it is found on calcareous sites, limestone or siltstone, usually associated with eastern red cedar and hence its name. It is not known from the DBNF, but occurs nearby in habitat that is found on the forest. It can form dense patches or occur in scattered plants in grasses and forbs. It occurs in the open areas between cedar trees and appears to require moderate to high light. Light fire might be of benefit.

Purple Caric Sedge – *Carex purpurifera* – This sedge has a narrow range in the Central Hardwoods area. It grows in mesic forests, primarily hardwood. On the DBNF, it is known from several scattered locations all in dry-mesic oak or mixed mesophytic forest. Shade is moderate to light.

References:

- Baker, M.D. and Michael J. Lacki. 1997. Short-term changes in bird communities in response to silvicultural prescriptions. *Forest Ecology and Management* 96 (1997) 27-36.
- Buehler, D.A., and C.P. Nicholson. 1997. Ecology of the Cerulean Warbler in the Cumberland Mountains and the Southern Appalachians. 1996 Annual Report. Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.
- Hamel, Paul B. 1992. Land manager's guide to birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Mengel, R.M. 1965. The birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581pp.
- Palmer-Ball, B.L. 1996. The Kentucky breeding bird atlas. The University Press of Kentucky, Lexington, KY. 372pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.

07/15/2003

Attachment C.

Dry-Xeric Cedar-Oak Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
6-Dry-Xeric Cedar-Oak	Dry-Xeric Cedar-Oak Forest	(blank)	BIRD	Eastern Wood Pewee/ Contopus virens
		Basic Substrate	GASTR	Pupilids/ Pupillidae
			P-DIC	Mountain Lover/ Paxistima canbyi
				Cutleaf Meadow-parsnip/ Thaspium pinnatifidum
		Drainage Good	P-DIC	Mountain Lover/ Paxistima canbyi
		Dry	BIRD	Summer Tanager/ Piranga rubra
			GASTR	Pupilids/ Pupillidae
			P-GYM	Eastern Redcedar/ Juniperus virginiana var. virginiana
		Elevation (above 2300 ft)	BIRD	Least Flycatcher/ Empidonax minimus
		Fire Tolerant/Enhanced		Least Flycatcher/ Empidonax minimus
				Red-headed Woodpecker/ Melanerpes erythrocephalus
		Forb/Grass Condition	P-MON	Juniper Sedge/ Carex juniperinum
		Large Decadent Trees	BIRD	Eastern Wood Pewee/ Contopus virens
		Mature forest		Eastern Wood Pewee/ Contopus virens
				Red-headed Woodpecker/ Melanerpes erythrocephalus
				Ovenbird/ Seiurus aurocapillus
		Mid-age Forest	BIRD	Eastern Wood Pewee/ Contopus virens
				Ovenbird/ Seiurus aurocapillus
		Open (Little or No Shade)		Summer Tanager/ Piranga rubra
			GASTR	Pupilids/ Pupillidae
			P-DIC	Nettle-leaf Sage/ Tragia urticifolia
			P-MON	Purple Caric Sedge/ Carex purpurifera
		Open Forest Canopy	BIRD	Least Flycatcher/ Empidonax minimus
				Red-headed Woodpecker/ Melanerpes erythrocephalus
				Summer Tanager/ Piranga rubra
			P-DIC	Cutleaf Meadow-parsnip/ Thaspium pinnatifidum
			P-MON	Juniper Sedge/ Carex juniperinum
		Open Midstory/Understory	BIRD	Eastern Wood Pewee/ Contopus virens
				Summer Tanager/ Piranga rubra
				Ovenbird/ Seiurus aurocapillus
		Rocky/Rocks	P-GYM	Eastern Redcedar/ Juniperus virginiana var. virginiana
		Shrub/Sapling Condition	BIRD	Least Flycatcher/ Empidonax minimus
		Snags > 6" dbh		Red-headed Woodpecker/ Melanerpes erythrocephalus
		Tree and Snags (Cavity Nesters)		Red-headed Woodpecker/ Melanerpes erythrocephalus

Viability Assessment Report For Dry-Mesic Mixed Pine-Oak Habitat Association

Prepared by
Lynda Mills and Tim Reed
Daniel Boone National Forest

I. Description of Habitat Association

The Dry-Mesic Mixed Pine-Oak Habitat Association can be found to some degree throughout the Daniel Boone National Forest (DBNF). While represented on all districts, it is most common on the southern portions of the forest. Over 88 percent of the acres classed in this habitat association are located on the London, Somerset, and Stearns districts (USDA Forest Service, 1998). This habitat association can be found in several Land Type Associations (LTAs) but it is most common in the Southern Cliff (221Hc003), Rockcastle Hills (221Hc005), London-Corbin Plain (221Hc006) and Big South Fork Plateau (221Hc004) LTAs. It is also relatively common in the Central Cliff (221Hb002), Northern Rolling Low Hills (221Hb005), London-Corbin Plain Transition (221Hc007), and along the Northern Escarpment (221Hb004) LTAs (USDA Forest Service, 1997a).

This habitat association may occur in a variety of topographies. It is most typically found on sandstone and shale ridgetops and slopes with a northerly or easterly aspect (Jones, 1988). It may, however, occur on any slope and extend into drainages and flat bottomland areas. Soils typically have a somewhat loamy subsurface horizon, coarse texture, and are well drained. Soil depths generally run from 5 to 40 inches on the ridges and 40 plus inches on the slopes. Most sites will grade into mesic oak, southern yellow pine or xeric pine-hardwood sites (SAMAB, 1996; Jones, 1988).

This association is a mix of yellow pine-hardwood and hardwood-pine stands occurring on dry to somewhat mesic sites and will typically have from 31 to 69 percent yellow pine in the overstory (USDA Forest Service, 1998). The ratio of pine and hardwood species is largely a product of the past disturbance regimes. The presence of hardwoods dominating many mixed stands is likely due to the absence of historic disturbance regimes and changes in land use in the majority of the sites over the past 75 to 100 years. Whereas past disturbance caused by more Native American burning, frequent wildfires and historic use of these sites for farming, grazing or heavy timber harvest may have encouraged the regeneration of shade-intolerant oaks and pines, more recent events such as the suppression of fires and succession of these sites to mature forest has favored shade-tolerant hardwoods other than oaks. The inclusion of more mesic sites in this habitat association may also explain the abundance of hardwoods in many of these mixed stands.

Overstory species that commonly occur in this habitat association include: shortleaf pine, pitch pine, white oak, chestnut oak, black oak, northern red oak, southern red oak, pignut hickory, mockernut hickory, and yellow poplar (and historically, American chestnut). Midstory associates include sourwood, redbud, sassafras, dogwood, blackgum, and red

maple. The shrub layer is typically ericaceous with blueberry, huckleberry, and laurels dominating the drier sites along with false Solomon's seal and wild geranium in the more mesic sites (USDA Forest Service, 1997; Jones, 1988). In mature stands, the midstory may be rather dense and well developed unless the site has been repeatedly burned or disturbed in some way that reduces the midstory component. The understory may be of moderate to low density and dominated by shade tolerant species due to closed canopy conditions. Exceptions are found where wide canopy breaks occur from natural disturbances or repeated burning.

II. Current Status of the Habitat Association on the Daniel Boone National Forest

Prior to the 2000-2001 southern pine beetle (SPB) epidemic, the DBNF had approximately 67,705 acres of forest area in the Dry-Mesic Mixed Pine-Oak Habitat Association (USDA Forest Service, 1998). This represented about 10 percent of the total forested area on the DBNF. However, it is believed that approximately 75 to 90 percent of the pine component has been killed as a result of the SPB epidemic. As a result, it is likely that approximately 2 percent of the total forested area on the DBNF is now in this habitat association. In 1998, approximately 61 percent (41,320 acres) of this was greater than 70 years old and the age classes less than 30 years old represented approximately 19 percent (12,909 acres) of this association.

On the DBNF, this association is typically thought of as a pine-hardwood group dominated by shortleaf pine-oak species. However, prior to the SPB epidemic, 55 percent of this association was classed as hardwood-pine where hardwoods represent 51 to 69 percent of the dominant and co-dominant species. Today, much more than 55 percent (due to the recent pine mortality) is likely to fall within hardwood-pine forest types.

Most of the mixed pine-oak stands that fall within this habitat association contain little or no advanced oak or shortleaf/pitch pine regeneration in the midstory or understory. This is likely a result of fire-suppression and lack of other disturbances that would allow adequate light to reach the understory layer and stimulate oak and pine regeneration. As a result, the midstory layer of these stands is composed of high densities of species such as dogwood, redbud, red maple and yellow poplar. The understories of these stands are generally completely shaded and contain shade-tolerant shrubs and herbaceous plants.

On the southern portion of the forest where this association occurred most frequently, or graded into other pine dominated associations, this association comprised a major portion of the lands considered suitable for red-cockaded woodpecker (RCW) recovery. Although stands with a higher component of hardwoods are less suitable for RCW use, many of the stands contained a sufficient amount of yellow pine to provide suitable foraging and nesting areas. This association usually occurs on sites with fair to good timber productivity and therefore it has historically been managed to some degree for wood production.

The devastation from the SPB epidemic has caused the loss of the yellow pine component in many of these formerly mixed pine-oak stands and will transform formerly mixed stands to sites dominated by hardwoods. Today, most of these sites would not be classified as mixed forest types because they do not contain at least 30 percent live yellow pine. This habitat association currently consists primarily of young regeneration areas not yet impacted by the

SPB and small, scattered areas of mature to mid-age mixed pine-hardwood that are quickly being transformed into hardwood-dominated areas.

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

A. Purpose and Need for Management of Dry-Mesic Pine-oak Communities

Recognition and management of mixed pine-hardwood types can produce a number of benefits. Since the DBNF occurs within the range of several hardwood and yellow pine species, many sites on the forest are well-suited to providing conditions conducive to growing healthy stands of both yellow pine and desirable hardwoods. As a result, many sites in the forest have likely been historically composed of a mix of pine and hardwood species. This in-stand diversity of tree species composition, which provides a mix of conifers and deciduous hardwoods, has resulted in a high diversity of plants and animals within these stands. Many of these wildlife and plant species (including those in Attachment A) find suitable conditions within these stands because they are attracted to either the yellow pine or the deciduous hardwood component of these stands, or in many cases, to the disturbance regime (often, fire) that often maintains the mixed pine-oak stand composition.

Within the Dry-Mesic Mixed Pine-Oak Habitat Association, the following conditions are needed to ensure persistence of species identified in Attachment A:

Acidic substrate	Elevations above 2300'	Leaf Litter	Open Canopy	Snags > 6" and > 20" dbh
SE to NW Aspect	Ericaceous shrubs	Mature Forest	Open Midstory/Understory	Snags of any size
Dense Shrub Understory	Periodic burning	Mid-age Forest	Rich soil	Water nearby
Downed Logs	Forb/Grass Conditions	Moderate Shade	Rocky areas	Large tracts of suitable habitat
Good Drainage	Minimal forest edge/Interior Habitat	Moist Conditions	Sandy Soils	Trees with Cavities
Poor Drainage	High Shade	Old Growth Conditions	Shrub/Sapling Conditions	Trees > 20" dbh
Dry Conditions	Large Decadent Trees	Open (Little or no shade) areas	Slopes/Steepness	Upland Areas

Many of these conditions (such as sandy soils, slope, drainage) are factors of geology and topography and not normally influenced by standard forest management activities. Where forest management activities may influence these conditions, however, standards and guidelines are presented in this analysis to ensure that these conditions continue to be

present within the Dry-Mesic Mixed Pine-Oak Habitat Association in order to ensure the persistence of species identified in Attachment A.

B. Desired Future Condition

AGE CLASS

To provide for the greatest diversity and meet requirements of all species listed in Attachment A, a variety of age classes within this habitat association are recommended. The conditions represented by these various age classes provide important habitat conditions for the species listed in Attachment A. For example, maintaining a component of this habitat association in the 0 to 10 year old age class would provide for species that require patches of bare ground, thickets, briars, vines and forbs, whereas, a 10 to 30 year old component would better serve species that require taller, more dense, woody, shrubby early successional habitat. Species that simply require brushy conditions, regardless of stem density or type would be provided by both the 0 to 10 year and 10 to 30 year component of this habitat association. Species that only prefer a component of this habitat association in a forested condition that is dominated by trees of varying heights and densities but do not require older trees for mast production and cavities or snags would need a component of this habitat association greater than 20 years of age. Species most dependent upon mature stands that provide cavity trees, large snags, and production of acorns and pine seed would be best provided for by maintaining a component of this habitat association greater than 80 years of age.

However, it is also recognized that the DBNF is currently well below the desired levels of 20 plus year old mixed forest types and has an unbalanced age class distribution of mixed forest types as a result of the SPB epidemic. The desired age class distribution is based upon the viability needs of all the species in Attachment A and would ensure persistence of all these species within the dry-mesic pine-oak community (assuming other recommendations made in this analysis are implemented). However, because of the SPB epidemic, it will be impossible to achieve this desired age class distribution within the next planning period. The age class distribution over the next planning period is more likely to reflect an increase in the 0 to 10 year old age class and a decrease in the 20 plus

The desired age class distribution of dry-mesic mixed pine-oak habitat.

Desired Successional Class	percent desired in pine-hardwood forest types*	percent desired in hardwood-pine forest types*
Forest 0-10 years of age	~6 percent (1998-pre SPB levels)	~5 percent (1998 levels-pre SPB)
Forest 0-30 years of age	~27 percent (1998-pre SPB levels)	~16 percent (1998-pre SPB levels)
Forest 20-80 years of age	~45 percent (1998-pre SPB levels)	~50 percent (1998-pre SPB levels)
Forest 80 plus years of age	~42 percent (1998-pre SPB levels)	~42 percent (1998-pre SPB levels)

*Rationale for using 1998 levels: Monitoring of some species that are identified in Attachment A (primarily birds) immediately before, during and after 1998 did not reveal any significant declines of these species during that time period, therefore, it is assumed that age class distributions that existed during that time period were adequate in ensuring persistence of these species on the forest and within this habitat association.

year old age class for this habitat association. As a result, the age class distribution expected over the next planning period is not likely to provide for short term persistence of all these species on the DBNF, particularly those species that require large tracts of mature pine-dominated forest. This desired age class distribution will provide for the following habitat conditions within the Dry-Mesic Mixed Pine-Oak Habitat Association: Dense shrub understory, large decadent trees, mature forest, mid-age forest, old growth conditions, shrub/sapling conditions, and trees > 20" dbh.

OVERSTORY

The overall landscape composition of the DBNF is based upon many influences. Based upon existing forest structure and needs of species identified in Attachment A, the desired forest composition of dry-mesic pine-oak habitat is as follows:

Desired level of DBNF that will be in a dry-mesic pine-hardwood forest type	4.5 percent 1998 1 percent likely in 2001 (-3.5 percent) 4-6 percent desired
Desired level of DBNF that will be in a dry-mesic hardwood pine forest type	5.6 percent 1998 9.1 percent likely in 2001 (plus3.5 percent) 4-6 percent desired
Total desired level of DBNF that will be in a dry-mesic pine-oak Habitat Association	10 percent in 1998 10 percent likely in 2001 6-8 percent desired

These desired levels are based upon the assumption that the recommendations outlined in this analysis are implemented. Implementation of these recommendations will help assure persistence of the species identified in Attachment A.

MIDSTORY AND UNDERSTORY

It is desired that mixed pine-oak stands be somewhat self-sustaining. This will require the use of techniques, primarily burning and thinning, that will encourage advanced pine and oak regeneration in the understory and create a somewhat open midstory. The use of these techniques will likely create a midstory that contains species such as dogwood, sourwood, sassafras and blackgum and an understory of sedges, grasses, grapes, bracken fern, ericaceous shrubs such as huckleberries and blueberries, and mountain laurel. In the more mesic pine-oak sites, the midstory and understory would be expected to be less open and likely to contain more shade-tolerant species such as red maple and yellow poplar with an understory dominated more by deciduous shrubs and herbaceous plants.

General Strategy to be Used to Meet Desired Future Condition (DFC):

The general strategy that should be taken to achieve the Desired Future Condition is to implement future management that will favor oak in existing or historical hardwood-pine stands and pine in existing or historical pine-hardwood stands. This may lead to some stands becoming >70 percent hardwood or pine and being reclassified as upland hardwood forest types or southern yellow pine types rather than "mixed" forest types. An

exception to this will likely occur in cases where existing and historical hardwood-pine sites are contiguous with areas being managed for species that require large tracts of pine forest. Where the latter occurs, many of these hardwood-pine sites may be managed towards pine-hardwood types (50-69 percent pine) or will maintain their hardwood-pine classification.

C. Habitat Association General Direction and Standards and Guidelines

Forest-wide

General Direction: Create healthy dry-mesic pine-oak communities.

- Emphasize prescribed fire use in mixed forest types.
 - *Rationale: Extensive research has shown that both the pine and oak components of pine-oak stands respond favorably to somewhat open conditions created by burning and the reduction of less fire tolerant woody competition. Open conditions created by burning also benefit species identified in Attachment A that require an open canopy, open midstory/ understory, or are fire dependent/enhanced, and helps maintain an ericaceous and/or forb grass condition in the understory.*
- Implement periodic maintenance burns, including during the growing season to control undesirable woody vegetation in mixed forest types. (RCW FEIS).
 - *Rationale: Growing season burns will likely be the most effective in reducing undesirable hardwood stem density in the understory. Consider restoration of American chestnut in sites that lend themselves to this objective.*
 - *Rationale: American chestnut was historically a species dominant in the overstory of this Habitat Association.*
- Provide downed logs and large woody debris on the forest floor where this may be limited naturally.
 - *Rationale: Some species require the presence of down logs on the forest floor within this habitat association and where the presence of down logs is not provided due to natural events or as a result of forest management activities, there should be an attempt made at restoring this habitat condition.*

General Direction: Maintain or restore shortleaf or pitch pine dominance within existing and historical pine-hardwood stands.

- *Rationale: Ensuring a pine dominance in pine-hardwood stands will contribute to the overall availability of yellow pine across the landscape in levels that will provide for the persistence of species that are restricted or dependent upon the presence of stands of pines and other conifers. Shortleaf and pitch pines are the desirable pine species because they are longer lived than Virginia pine and can*

provided habitat for species associated with the dry-mesic pine-oak community over a longer period of time than Virginia pine-oak sites may provide.

- Where pine-hardwood stands are considered not adequately stocked to maintain a > 50 percent pine overstory dominance, implement management that will increase the pine stocking in the understory using a variety of methods such as controlled burning, planting, releasing advanced regeneration, and other methods that may be applicable.
 - *Rationale: Stands that contain less than 50 percent pine overstory would not be considered pine-hardwood forest types. It is important to maintain a pine dominance in some of these mixed stands in order to provide for species that require contiguous pine habitat and for species that are restricted to pines for foraging purposes (such as red-cockaded woodpecker). Periodic burning will produce a better seedbed for pine regeneration and limit competition from species that are less tolerant of burning than pines. Also improves habitat for fire-tolerant/enhanced species. If burns are conducted prior to pine seed dispersal, there is a greater chance that seed will fall on a site where it can successfully sprout and remain viable. If burning cannot occur during this time, then burns should focus on limiting the amount of non-desirable sprouts within the pine-hardwood stands in order to maintain pine dominance in these sites. Once pine stocking levels in the understory become adequate, controlled burning should be curtailed to allow pine seedlings time to grow. Once pine stocking in the understory reaches the desired level to maintain a >50 percent pine dominance, burning should be curtailed so that young seedlings have a chance to grow without being killed back by other burns. Pine regeneration generally needs to be released from hardwood competition, especially in mixed sites.*
- Conduct site prep activities that will provide the best results for desired pine regeneration such as implementing spring to early summer felling of non-desirable residuals that are > 5 feet tall and allowing felled residuals to be allowed to dry until early to mid-July before burning (Phillips and Abercrombie, 1987). Consider use of herbicides or low intensity burning treatments to release pine seedlings.
 - *Rationale: Site prep at this time will coincide with timing for better site prep burns and follow-up planting. Allowing residuals to "cure" for a few months will improve the effectiveness of a follow-up site prep burn. Studies show that burning after July 1 has the greatest effectiveness on preparing a site for planting that following winter and maximizes the consumption of residual slash on the ground that could impede planting efforts and successful pine regeneration. By planting after the burn, planting is easier to do and the seedlings have less competition from other species. Also, planting in the winter and early spring is the best time for seedlings to get established. Following planting, some sites may need follow-up treatments to ensure that pine seedlings are not out-competed by less desirable species.*

- A variety of regeneration methods may be used to restore or regenerate pine-hardwood forest types, the most appropriate of which is to be determined by site-specific objectives and needs.
 - *Rationale: Regeneration of some pine-hardwood forest types will provide habitat for those species that require early successional forest as well as interior forest edge conditions.*
- All healthy shortleaf and pitch pines should be retained during stand restoration activities, unless their density is greater than 70 square feet of basal area, in which case the desired trees should be thinned to improve pine regeneration in the understory and improve the health of the stand. (RCW FEIS)
 - *Rationale: "Restoration" implies that a shortleaf and pitch pine composition will be restored to the site. If there is already a component of this desired species in the stand, it should be retained, where it may provide a natural seed source, etc., unless its retention hampers further restoration of the site to a desired pine-hardwood type.*
- Maintain a pine basal area of 40-110 square feet, depending on site and stand condition and site objectives
 - *Rationale: Depending upon objectives for the site, the BA may be relatively low (40-50 BA if the site is managed as a pine-oak barrens, for instance) or it may be relatively high (80-110 BA if the site is being managed to provide dense conifer cover, or is in regeneration and densely stocked). An average BA of 40-110 (around 70BA) would be desired in the majority of pine-hardwood sites. Varying the basal area of stands will also provide a variety of shade conditions.*

General Direction: Maintain or restore an oak component within existing and historical hardwood-pine stands.

- *Rationale: Maintaining an oak component in these stands will ensure persistence of those plant and animal species that require the hardwood component of a mixed forest type, particularly oak, as well as species that require leaf litter on the forest floor.*
- A variety of regeneration methods and site prep techniques may be used to restore or regenerate desired oak species while maintaining a mixed pine-oak composition, the most appropriate of which is to be determined by site-specific objectives and needs.
 - *Rationale: Regeneration of some hardwood-pine forest types will provide habitat for those species that require early successional forest as well as interior forest edge conditions.*
- 1. Even-aged management is generally the preferred regeneration method for regenerating oaks in mixed forest types.

- *Rationale: Studies indicate that oaks require high amounts of sunlight for successful regeneration, and these conditions are best provided in even age management areas. Even-aged management will provide habitat for species that require larger stands (generally > 10 acres) of early successional forest habitat and for species that occupy areas with dense shrub understories .*
 - a) Clearcutting is the preferred method on relatively dry sites but relatively unsuccessful on mesic sites (Thompson and Dessecker, 1992).
 - *Rationale: Studies have shown that clearcutting on mesic hardwood-dominated sites often accelerates the site towards a mixed mesophytic community because more mesic sites generally have less advanced oak regeneration in the understory than drier sites. Drier sites generally have a greater accumulation of natural oak reproduction in the understory, which is favored by clearcutting.*
 - b) Shelterwoods are useful on more mesic sites where advanced oak regeneration is present (Thompson and Dessecker, 1992).
 - *Rationale: Shelterwoods are more useful on mesic sites that have less advanced oak regeneration in the understory because it controls stand density near the end of rotation when oak reproduction needs to accumulate.*
2. Uneven age management may be considered where even aged management does not meet site objectives.
- *Rationale: Implementing uneven aged management may allow for regeneration of pine-oak sites while still maintaining some of the overstory and some of the attributes of mature stands. Generally, however, uneven aged management does not provide many of the attributes of early successional habitat. Uneven-aged management may provide for species that will persist in small areas (generally < 2 acres) of early successional forest or for species that require some overstory trees with an early successional, dense, shrubby understory.*
 - a) **Group selection** cuts may be used providing that group selection cut openings are at least 1/10 of an acre in size (depending upon amount of advanced oak regeneration on site) (Thompson and Dessecker, 1992).
 - *Rationale: Creating openings will provide necessary light to facilitate growth of advanced oak reproduction in these sites as long as openings fall within 1/10 – ½ acre in size. Larger openings should be referred to as patch cuts or clearcuts.*

3. Controlled burning should be timed for early fall immediately preceding acorn seed dispersal from the overstory. Otherwise, burns should be conducted at times when maximum bud and sprout mortality of non-desirable hardwoods will occur.
 - *Rationale: If burns are conducted prior to acorn dispersal, there is a greater chance that acorns will fall on a site where it can successfully sprout and remain viable. If burning cannot occur during this time, then burns should focus on limiting the amount of non-desirable sprouts within the hardwood-pine stands in order to maintain oak dominance in these sites.*
4. Retain some mature oaks in regeneration stands to sustain acorn production.
 - *Rationale: Retaining mature oaks in regeneration stands will provide for species that feed on acorns and prefer mature oaks in a very sparse, open canopy condition and will also provide a natural seed source for oak regeneration.*
5. Reduce competition from non-desirable hardwood species thru a variety of methods such as controlled burning and/or herbicide use. This may be especially necessary on sites that have a Site Index > 70 for black oak (Schlesinger, 1993).
 - *Rationale: On hardwood-pine sites with higher site indices, there may be sufficient competition from other hardwood species to out compete the more desirable oak species. Burning, overstory release and herbicide use have all been shown to retard the development of competing non-oak saplings. Release, particularly overstory release, should be conducted when oak seedlings are at least 4.5 feet tall (Schlesinger, 1993). Studies show that oaks of less than 4.5 feet tall generally are not big enough to out compete other nondesirable hardwood saplings in a site.*

General Direction: Provide large cavity trees and snags in mature dry-mesic pine-oak communities.

- *Rationale: For some species identified in Attachment A, the presence of large cavity trees and snags in the dry-mesic pine-oak community is necessary for their persistence within that community. This standard and guideline will provide for the presence of cavity trees and snags within this habitat association.*
- Establish rotation ages that will ensure that mature, heart-rotted, and large diameter yellow pines and oaks are provided on the landscape.
 - *Rationale: By increasing the rotation age, a supply of old, decadent, heart-rotted pines and oaks should be available for species that require these kinds of trees for nesting, foraging or perching. This provides the condition of large decadent trees within this habitat association.*

- Existing pine and pine-hardwood stands of desirable pine type will not be regenerated until they reach rotation age, but thinning may occur in these stands. If regeneration of pine and pine-hardwood types is necessary to help achieve a balanced age class, regeneration may occur, but not in the oldest 1/3 of pine and pine-hardwood stands (RCW FEIS).
 - *Rationale: By retaining the oldest 1/3 of pine and pine-hardwood stands, species that require mature pine-dominated forest and older, mature pines should be provided for. Thinning will also provide moderate shade conditions for some species.*
- Provide artificial cavities and nest boxes for species that may be limited by cavity availability.
 - *Rationale: Artificial cavities and nest boxes can provide nesting and roosting habitat for species that may be limited by the unavailability of snags and den trees within the dry-mesic pine-oak communities.*
- Retain existing snags in project areas except where they would interfere with project purpose and need.
 1. No snags will be intentionally felled within project areas associated with timber management.
 - *Rationale: This will insure that deliberate attempts to reduce the snag component within timber management areas will not occur and help ensure the presence of snags of any size within this habitat association.*
 2. Within project areas, at least three snags per acre at least 9" dbh will be retained.
 - *Rationale: This will help insure that larger diameter snags > 6" and > 20" dbh will be provided in project areas that fall within dry-mesic pine-oak forest types.*
 3. Live trees will be girdled if the existing density of standing dead trees does not meet this standard.
 - *Rationale: This will provide suitable snags in areas where snag availability may be limited.*
 4. Snags considered to be immediate threats to human safety may be removed anytime. Those not identified as immediate hazards should be removed during the Indiana bat hibernation season.
 - *Rationale: This will protect species that may be using snags for breeding purposes.*

General Direction: Provide contiguous pine-dominated habitat for forest-interior pine-dependent species on the London, Somerset and Stearns Districts.

- *Rationale: Some species require large tracts of contiguous pine dominated habitat. Habitat requirements for these species would be best met on the London, Somerset and Stearns District because the southern part of the forest provides the greatest numbers of sites suitable for restoration and/or maintenance of the dry-mesic pine oak community.*
- Emphasize pine management in existing and/or historical hardwood-pine stands that are on the south end of the forest and are determined to be important links necessary for maintaining continuity of large tracts of contiguous pine dominated habitat.
 - *Rationale: Where habitat for species requiring contiguous and interior pine dominated habitat in large tracts, the conversion of hardwood-pine sites to pine-hardwood sites should be considered since often, these hardwood-pine sites are located adjacent to pine dominated stands and contain suitable site characteristics that make them suitable for either pine or hardwood dominance.*
- Limit regeneration patch sizes in pine and pine-hardwood forest types:
 - *Rationale: Patch size on the south end of the forest within pine dominated forest types should be limited because the south end of the forest offers the best and only potential for providing habitat for species that require large tracts of mature pine dominated forest.*
- 1. Regeneration patch size for *restoration* of pine or pine-hardwood forest types will not exceed 40 acres (RCW FEIS)
 - *Rationale: It is understood that for restoration purposes, there will be a need to accelerate regeneration of these forest types and increasing patch size is one method of doing that.*
- 2. Regeneration within pine or pine-hardwood forest types for *non-restoration* purposes will not exceed 25 acres (RCW FEIS and current FMP)
 - *Rationale: Limiting patch size will help maintain the continuity of mature pine-hardwood forest types.*
- Avoid creation of permanent or temporary barriers that inhibit or prevent movement of forest-interior pine-dependent species between areas of activity.
 - *Rationale: The creation of permanent and temporary barriers on the south end of the forest within pine dominated forest types should be limited because the south end of the forest offers the best and only potential for providing habitat for species that require large tracts of mature pine dominated forest and habitat for these species could be fragmented by the unlimited creation of permanent or temporary barriers.*

- Provide some overstory pine habitat within regeneration areas.
 - *Rationale: Because the south end of the forest offers the best and only potential for providing habitat for species that require large tracts of mature pine dominated forest, the retention of some pine habitat within the overstory of regeneration areas may provide for a mature pine component within these stands and mitigate the potentially fragmenting effects to mature pine dominated habitat that could occur were no mature pine overstory retained.*
 - Regeneration areas where contiguous habitat for forest-interior pine-dependent species may be limited will retain 40 square feet of pine basal area when it is available (RCW FEIS)
 - *Rationale: Maintaining a 40 BA of pine will maintain attributes of a mature pine-hardwood stand while also allowing stand regeneration.*
1. Trees retained should be selected in the following order:
 - relict trees,
 - other potential cavity trees,
 - *Rationale: Retention of these trees will ensure that trees most likely to develop heartrot and provide habitat for cavity dependent species are provided.*
 - other trees > 10" that represent the best seed producers (RCW FEIS)
 - *Rationale: Retention of these trees will provide the best natural seed source for the stand to be regenerated.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

There are basically no species listed in Attachment A that would fail to persist on the DBNF if the Dry-Mesic Mixed Pine-Oak Habitat Association was not maintained on the Forest, **as long as** southern Yellow Pine and Dry-Mesic Oak Habitat Associations are provided. Because the DBNF is a hardwood-dominated forest overall, those species identified in Attachment A that are attracted to the hardwood component of dry-mesic pine-oak habitats would not likely be greatly affected by loss of this habitat association on the Forest. However, the presence of pine and open, fire-maintained habitat is a more limiting factor on the DBNF and many species would persist in much lower numbers on the DBNF if the sites recommended in this analysis for pine-hardwood management were converted to hardwood-dominated systems or were not maintained by some level of burning. For this reason, it is recommended that species that are most dependent upon the pine and fire component of this Habitat Association be monitored. Those species are:

Pine warbler, Red-cockaded woodpecker, Pitch pine

These two bird species are currently being monitored on an annual basis through the DBNF's implementation of the Southern National Forests' Migratory and Regional Landbird Conservation Strategy, as well as thru the use of roadside point counts and it is recommended that this monitoring continue and be given high priority to ensure our awareness of persistence of these species. Currently, the DBNF monitors the presence of pitch pine and other tree species in its ongoing CISC and it is recommended that this continue on a regular basis.

The condition of the dry-mesic pine-oak community should also be monitored by including attributes such as midstory density, understory description and condition, and a past history of stand treatments as part of the regular field inventory of stands. High priority should be given to conducting field inventories to gain data on a number of stand/site attributes such as soil conditions, slope, aspect, dominant and codominant stem densities, midstory and understory composition, and estimation of site quality. Utilize existing databases such as CISC, Forest Inventory, as well as GIS spatial data, aerial photographs, historical land use patterns, etc. Utilize Forest Service Ecological Classification System descriptions of Landtypes and Landtype Phases, which are based largely upon material outlined by Smalley (1983; 1984; 1986). Prior to making decisions that affect stand composition of individual sites on the forest, this information should be gathered to provide guidance as to what management decisions would be best for restoring or maintaining a dry-mesic pine oak community on a particular site, or in some cases, to justify management of the site for some other habitat association.

Monitoring should also be conducted the summer following burning to determine natural pine and oak stocking as a result of burning activities. This monitoring is of medium priority but will reveal whether or not the burn reached the objective of improving pine or oak viability in the site or had a negative effect upon the stand and its desired condition.

References:

- Jones, S. M. 1998. Old growth forests within the piedmont of South Carolina. *Nat. Areas J.* 8(1): 31-37
- Phillips, D.R. and J. A. Abercrombie, Jr. 1987. Pine-hardwood mixtures: a new concept in regeneration. Reprinted from the *Southern J. of Appl. For.* 11(4): 192-197.
- SAMAB, Southern Appalachian Man and the Biosphere. 1996. The Southern Appalachian assessment terrestrial technical report. Report 5 of 5. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA.
- Schlesinger, R.C., I.L. Sander, and K.R. Davidson. 1993. Oak regeneration potential increased by shelterwood treatments. *North. J. Appl. For.* 10 (4): 149-153.
- Smalley, G.W. 1983. Classification and evaluation of forest sites on the Eastern Highland Rim and Pennyroyal. Gen. Tech. Report SO-43. U.S. Department of Agriculture, Forest Service, Southern Research Station. New Orleans, LA. 123 pp.

- Smalley, G.W. 1984. Classification and evaluation of forest sites in the Cumberland Mountains. Gen. Tech. Report SO-50. U.S. Department of Agriculture, Forest Service, Southern Research Station. New Orleans, LA. 84 pp.
- Smalley, G.W. 1986. Classification and evaluation of forest sites on the Northern Cumberland Plateau. Gen. Tech. Report SO-60. U.S. Department of Agriculture, Forest Service, Southern Research Station. New Orleans, LA. 74 pp.
- Thompson, F.R. and D. R. Dessecker. 1997. Management of early successional communities in central hardwood forests, with special emphasis on oaks, ruffed grouse, and forest songbirds. Gen. Tech. Report NC-195. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. St. Paul, MN.
- USDA Forest Service. 1997. Guidance for conserving and restoring old-growth forest communities on National Forests in the Southern Region: report of the Region 8 old-growth team. Forestry Report R8-FR 62. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA. 117 pp.
- USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 1998. Continuous Inventory of Stand Condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

Attachment A.

Species List: Dry-Mesic Mixed Pine-Oak

Class	Common Name/ Species
ANIMALS	
Birds	Sharp-shinned Hawk/ <i>Accipiter striatus</i> Bachman's Sparrow/ <i>Aimophila aestivalis</i> Chuck-will's Widow/ <i>Caprimulgus carolinensis</i> Eastern Wood-Pewee/ <i>Contopus virens</i> Cerulean Warbler/ <i>Dendroica caerulea</i> Prairie Warbler/ <i>Dendroica discolor</i> Yellow-throated Warbler/ <i>Dendroica dominica</i> Blackburnian Warbler/ <i>Dendroica fusca</i> Pine Warbler/ <i>Dendroica pinus</i> Least Flycatcher/ <i>Empidonax minimus</i> Acadian Flycatcher/ <i>Empidonax virescens</i> Worm-eating Warbler/ <i>Helminthos vermivorus</i> Wood Thrush/ <i>Hylocichla mustelina</i> Swainson's Warbler/ <i>Limnolophus swainsonii</i> Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i> Kentucky Warbler/ <i>Oporornis formosus</i> Red-cockaded Woodpecker/ <i>Picoides borealis</i> Summer Tanager/ <i>Piranga rubra</i> Ovenbird/ <i>Seiurus aurocapillus</i> American Redstart/ <i>Setophaga ruticilla</i> Red-breasted Nuthatch/ <i>Sitta canadensis</i> Yellow-throated Vireo/ <i>Vireo flavifrons</i>
Insects	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i> Diana Fritillary/ <i>Speyeria diana</i> Regal Fritillary/ <i>Speyeria idalia</i>
Reptiles	Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i> Southern Five-lined Skink/ <i>Eumeces inexpectatus</i> Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i> Northern Pine Snake/ <i>Pituophis melanoleucus melanoleucus</i> Southeastern Crowned Snake/ <i>Tantilla coronata</i>
PLANTS	
Dicots	Eastern Silvery Aster/ <i>Aster concolor</i> American Chestnut/ <i>Castanea dentata</i> Chinquapin (generic)/ <i>Castanea pumila</i> Allegheny Chinquapin/ <i>Castanea pumila</i> var. <i>pumila</i> Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>

Class	Common Name/ Species Small-flowered Thoroughwort/ <i>Eupatorium semiserratum</i> Box Huckleberry/ <i>Gaylussacia brachycera</i> Red-disked Sunflower/ <i>Helianthus atrorubens</i> Smooth Veiny Peavine/ <i>Lathyrus venosus</i> Carolina Anglepod/ <i>Matelea carolinensis</i> American Cow Wheat/ <i>Melampyrum lineare</i> American Cow Wheat/ <i>Melampyrum lineare</i> var. <i>pectinatum</i> Sweet Pinesap/ <i>Monotropis odorata</i> Gaywings/ <i>Polygala pauciflora</i> Racemed Milkwort/ <i>Polygala polygama</i> var. <i>polygama</i> Hairy Snout Bean/ <i>Rhynchosia tomentosa</i> Slender Marsh-pink/ <i>Sabatia campanulata</i> American Chaffseed/ <i>Schwalbea americana</i> Big-flowered Snowbell/ <i>Styrax grandiflorus</i> Spiked Hoary-pea/ <i>Tephrosia spicata</i> Bird's-foot Violet/ <i>Viola pedata</i>
Gymnosperms	Ground Juniper/ <i>Juniperus communis</i> var. <i>depressa</i> Pitch Pine/ <i>Pinus rigida</i>
Liverworts	A liverwort/ <i>Nowellia curvifolia</i>
Monocots	Grass-pink/ <i>Calopogon tuberosus</i> Boott's Caric Sedge/ <i>Carex picta</i> Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i> Spotted Coralroot/ <i>Corallorhiza maculata</i> Pink Lady-slipper/ <i>Cypripedium acaule</i> Bearded Skeleton Grass/ <i>Gymnopogon ambiguus</i> Wood Lily/ <i>Lilium philadelphicum</i> var. <i>philadelphicum</i>
Mosses	Dog Paw Moss or Elegant Moss/ <i>Dicranum scoparium</i>

Attachment B.

Dry-Mesic Mixed Pine-Oak Habitat Association Species/Habitat Relationships with References

ANIMALS

Birds

Sharp-shinned Hawk – *Accipiter striatus* – This species would be attracted primarily to the pine component of mixed pine-oak forest, primarily for nesting purposes. During the year, sharp-shinned hawks utilize both hardwoods and conifers and, in general, are most abundant in areas where a mixture of tree types exists. Although they are known to nest in hardwoods, birds in Kentucky seem to prefer evergreens for nesting and overwintering. A large, mature pine is a typical nesting site, provided it is within an extensive tract of forest. Although sharp-shinned hawks are observed (particularly when foraging) in areas having a mix of forested and semi-open habitat, they more frequently occur in forested tracts and are considered forest interior birds (Hamel, 1992). In May 2000, a sharp-shinned hawk nest was observed in a mature yellow pine tree in the Big South Fork National River and Recreation area, which is near the Daniel Boone National Forest (L.Perry, pers. obs.)

Bachman's Sparrow – *Aimophila aestivalis* – This species typically requires dense grassy places where scattered trees or saplings are present, usually in pine forests (Hamel, 1992). Historically, it was found in mature to old growth southern pine woodlands subject to frequent growing-season fires (NatureServe, 2001). This provided the grassy undergrowth required by this species. This species formerly inhabited a variety of early successional habitats in Kentucky (Palmer-Ball, 1996). Only habitats that have been frequently burned and have developed a grassy understory would be expected to support this species and most often, on the Daniel Boone National Forest, these are the drier mixed pine-oak sites.

Chuck-will's Widow – *Caprimulgus carolinensis* – This species tends to favor mixed oak and pine stands (DeGraaf et. al., 1991). It may occur and breed in general woods and forests that are primarily dry or mesic (Hamel, 1992). It appears to be much more common in drier forest where the understory and midstory levels are relatively open (Palmer-Ball, 1996). It typically feeds over adjacent fields and clearings (Hamel, 1992). Only forested habitats that have developed an open understory, generally thru repeated burning, would be expected to support this species and most often, on the Daniel Boone National Forest, these are mixed pine-oak sites.

Eastern Wood Pewee – *Contopus virens* – This species preferred habitat is rather open mature woodland in a rather dry situation (Hamel, 1992). This species may be absent from younger, second growth forest where an open midstory has not yet developed. In such habitat they often frequent edges and road or stream corridors (Palmer-Ball, 1996). They typically utilize large deciduous trees for the nest site but may use conifers in mixed forest types. This species may be found in numbers in most major forest types examined in Kentucky (Mengel, 1965). This species would be primarily attracted to the hardwood component of this habitat association when combined with dryness and upland situations.

Cerulean Warbler – *Dendroica caerulea* – This species would be primarily attracted to the hardwood component of mixed pine-oak stands. Cerulean warblers depend primarily on extensive tracts of mature, relatively undisturbed, deciduous forest. These birds occur in floodplains and upland sites that have large trees (> 20" dbh) in which to nest. Both nesting and foraging take place in the canopies of hardwoods. Stands are usually somewhat open, with little understory; however, according to Buehler and Nicholson (1997), monitoring data suggests that breeding territories in the Cumberland Mountains tend to have fewer canopy trees and greater shrub coverage than those elsewhere. The birds are rarely found in tracts less than 250 hectares, whereas maximum population densities occur in tracts greater than 3000 ha (Buehler and Nicholson 1997). Hamel gives a minimum tract size of 1750 ha (1992).

Prairie Warbler – *Dendroica discolor* – This species would be particularly attracted to the pine component of this habitat association. Prairie warblers occur in semi-open, early successional, and woodland habitats. Mixed forest type, especially those that have been cut-over or burned, with pines and cedars are occupied. Forest edges, clearings, brushy borders, and overgrown fields with scattered saplings or small trees are commonly used. On the Daniel Boone National Forest, the birds are nearly always found in early successional habitat, especially young clearcuts and the undergrowth of shelterwood cuts, wood edge, and in stands that have been burned (L. Perry, pers. obs.).

Yellow-throated Warbler – *Dendroica dominica* – This species would be attracted primarily to the pine component of mixed pine-oak forest. These warblers require extensive tracts of mature pine and pine-hardwood forests. In some areas, hardwood-pine is used; however, birds on the Cumberland Plateau show a preference for pine (Mengel 1965). Sites may range from moderately moist to dry/upland, provided the stands are rather open and have large trees (> 20" dbh). On the Daniel Boone National Forest, the birds are frequently observed in mature pine trees, and almost always observed in or near pines; they are frequently seen in stands with open canopies (L. Perry, pers. obs.).

Blackburnian Warbler – *Dendroica fusca* – This is a forest interior species of higher elevations, with most of the birds that are recorded in the Cumberland and Southern Appalachians occurring above 3500 feet. A variety of coniferous and mixed forest types are utilized, with deciduous habitat being used to a greater extent in this southern part of the breeding range. Extensive tracts of mature forest, with large (> 20" dbh) nesting trees, are required. Because of its affinity for conifers, on the Daniel Boone National Forest, this species may be occasionally encountered during periods of migration in mature stands containing pines but would not be expected to breed in these stands except in areas where elevations are greater than 3500', of which there are few of.

Pine Warbler – *Dendroica pinus* – This species would be attracted primarily to the pine component of mixed pine-oak forest. Pine warbler habitat consists of open to fairly dense stands of yellow pine and pine-hardwood. Although most numerous in extensive pine stands, the birds will use small stands of pine, as well (Mengel 1965). Suppression of fire has contributed to reduction of pine in some areas (Palmer-Ball 1986). Both middle-aged and mature stands are used; however, nesting is usually in mature pines.

Least Flycatcher – *Empidonax minimus* – This is a species of open conditions; it is rarely encountered deep in the forest. Open, deciduous woods (particularly those that have been

disturbed by burning or logging), forest edge, fields with scattered large trees, and other habitats that provide early successional conditions are utilized. During spring migration, Mengel (1965) observed male birds in alders and willows in a marshy, Laurel County meadow. Most of the breeding population frequents elevations above 2500 feet. The least flycatcher would be attracted to those mixed pine-oak habitats that have been repeatedly burned, and provide a rather open condition with an early successional understory.

Acadian Flycatcher – *Empidonax virescens* – This species is usually found near water generally near a stream course or some small waterway (Hamel, 1992). It generally uses an open, moderate understory for feeding in a stand with tall trees and closed canopy (DeGraaf et. al., 1991). It is associated with forested tracts at least 37 hectares (91.4 acres) in size (Hamel, 1992). Daniel Boone National Forest monitoring data indicates that the greatest number of occurrences for this species were in mesophytic-cove habitats greater than 80 years old. Assuming streams are nearby, this species would be attracted to those pine-oak forests where more mesic, shaded and damp conditions exist.

Worm-eating Warbler – *Helmitheros vermivorus* – Worm-eating Warblers inhabit moist, shady forest on moderate to steep slopes. In eastern Kentucky, the birds are common on deeply shaded slopes in mixed mesophytic woods and moist ravines (Mengel 1965). They are usually found in fairly mature deciduous or mixed forest with a dense understory, preferably of rhododendron and Mountain Laurel, but will also use younger forest and forest edge. Nesting is typically on sloping ground among leaf litter, while foraging is carried out on the ground or among understory vegetation. Although the species occurs in dissected woodland, it avoids isolated tracts (Palmer-Ball 1986). Hamel (1992) lists the minimum necessary tract size as 370 ha. This species would be attracted to the hardwood component of this habitat association, where conditions remain rather mesic.

Wood Thrush – *Hylocichla mustelina* – The wood thrush is found in a wide variety of forest types, provided a well-developed understory is present. Moderately shaded, deciduous and mixed stands of mature trees with a dense shrub and/or sapling understory are typical habitat, particularly when occurring on moist sites. Rich hardwood and bottomland forests are favored; however, drier sites may be used, so long they have the relatively dense shrub layer. Nesting is in shrubs, vines, and small trees. Although the species will tolerate some fragmentation of habitat, it is most common in extensive forest and requires a minimum tract size of 3 hectares (Hamel 1992). This species would be attracted to the hardwood component of this habitat association, where conditions remain rather shaded and somewhat mesic.

Swainson's Warbler – *Limnothylops swainsonii* – This forest interior species is found within tracts of moist, extensive forest that have dense understory (Palmer-Ball, 1996). Hemlock ravines, having dense growths of rhododendron and laurel, and bottomland forest, with a well-developed understory and/or thickets of small trees, are favored locations. Dense cane breaks are also used. On the Daniel Boone National Forest, this bird is often observed in damp, shady hemlock ravines with an understory of rhododendron, near small streams (L.Perry, pers. obs.). Assuming streams are nearby, this species would be attracted to those pine-oak forests where more mesic, shaded and damp conditions exist.

Red-headed Woodpecker – *Melanerpes erythrocephalus* – Semi-open to open habitat with an abundance of large (> 14" dbh), dead trees is preferred for both breeding and wintering purposes. Relatively open, mature woods, swamps, clearings within mixed woodland, forest edges, and places where groves of trees are present, such as park-like settings, are commonly used. On the Daniel Boone National Forest, the birds are often observed in pine-dominated stands that have been frequently burned (L. Perry, pers. obs.). Nesting is in dead trees, or in dead limbs of live trees (Mengel 1965). This species generally avoids mature closed canopy forest during the breeding season (Palmer-Ball 1986). Only forested habitats that have developed an open understory, generally thru repeated burning, would be expected to support this species and most often, on the Daniel Boone National Forest, these are mixed pine-oak sites.

Kentucky Warbler – *Oporonis formosus* – Kentucky warblers are most frequent in moist, shady, deciduous and mixed (with pine or hemlock) forest types with dense, shrubby understory. However, in eastern Kentucky, they occur in virtually all major associations except the most xeric pine and pine-oak communities, and may even invade them (Mengel 1965). Mature stands are required, though some younger stands and shrubby woodland borders are used, as well. These ground-nesting birds forage in understory vegetation, leaf litter, and soil. By providing a well-developed shrub layer, many tracts disturbed by selective logging are suitable for nesting even though the canopy has been disrupted (Palmer-Ball 1986). In general, these birds have adjusted better to landscape disturbance than other woodland warblers. This species would be attracted to the hardwood component of this habitat association, where conditions remain rather shaded and somewhat mesic.

Red-cockaded Woodpecker – *Picoides borealis* – This species would be attracted primarily to the pine component of mixed pine-oak forest. Habitat for this species is generally thought of as being primarily open pine woods. Nesting habitat is generally fairly mature pine trees with little or no midstory. The birds prefer conditions of minimal understory (Hamel, 1992). It is likely that the red-cockaded woodpecker used forests that were maintained by natural fires (Palmer-Ball, 1996). On the Daniel Boone National Forest this species seems to be attracted to open, frequently burned pine dominated stands where it selects live mature pine trees for nesting (L. Perry, Pers. Observation). These stands contain cavity trees that typically range in age from 90 to 128 years old and have an average diameter at breast height of 14.2-18.9 inches (Murphy, 1980). Due to southern pine beetle impacts to the primary habitat of this species, all known red-cockaded woodpeckers on the Daniel Boone National Forest were relocated out of state to suitable habitat in other populations.

Summer Tanager – *Piranga rubra* – This species would primarily be attracted to the oak component of mixed pine-oak stands for nesting purposes and the openness frequently found with sites that are frequently burned, which, on the Daniel Boone National Forest, are generally mixed pine-oak sites. Relatively dry sites, which tend to produce stands of a semi-open condition, are frequented by this species. Uplands are commonly used, but the birds may occur in a variety of habitats, including bottomlands and wooded residential areas. Forest types range from hardwood to pine-hardwood stands of open to medium density. On the Daniel Boone National Forest, the birds are frequently found in mature, mixed pine stands that have been burned and undergone midstory removal (L. Perry, pers. obs.). Oaks are often chosen for nesting, in open woodland or forest edge and often over open spaces such as roads and clearings (Mengel 1965).

Ovenbird – *Seiurus aurocapillus* – Ovenbirds would be attracted to the hardwood component of mixed pine-oak sites and prefer areas with lots of leaf litter (DeGraaf, Scott et. al. 1991). Mature and second growth forest conditions are utilized, on dry to moderately moist sites with light to moderate understory. Ovenbirds are more common in stands with closed canopies and open ground. This is a ground nesting species that forages in the leaf litter or on the soil. Mengel (1965) observed nests on logging roads and under small logs, sheltered by ferns, on steep, mesophytic slopes; however, Baker and Lacki (1997) note that birds are more abundant in non-harvested than in harvested areas. Upland stands and sloping terrain are preferred, but a variety of deciduous and mixed (e.g., pine-oak) forest types are used. This is a forest interior species having a minimum necessary tract size of 15 ha (Hamel 1992).

American Redstart – *Setophaga ruticilla* – This species typically utilizes younger forest and forest in early to mid stages of succession (Palmer-Ball, 1996). It usually occurs near water or streams preferring moist situations to dry ones (Barbour et. al., 1973) (Hamel, 1992). American redstarts occur in altered forest situations including selectively logged areas (Palmer-Ball, 1996). Daniel Boone National Forest monitoring data indicates this species is most common in forests 41 to 80 years old. Assuming streams are nearby, this species would be attracted to the hardwood component of these mixed stands where more mesic, shaded and damp conditions exist.

Red-breasted Nuthatch – *Sitta canadensis* – This species would be attracted primarily to the pine component of mixed pine-oak forest. Though this nuthatch is dependent on coniferous habitat, its requirements vary considerably between seasons. It generally breeds at elevations above 3500 feet, in dead spruce or fir trees. Occasionally, it will nest in hemlock and, rarely, in pine (Hamel, 1992). Suitable snags (dead trees) are greater than 6" dbh (six inch diameter at breast height). Mature stands are favored. The red-breasted nuthatch prefers to over-winter in dense stands of conifers and pine-oak. During that time, the birds are not particular to age class so much as to stand density. On the Daniel Boone National Forest, when these birds are encountered in winter, it is almost always while feeding in pines—especially mature Virginia pines having a lot of cones. Breeding records of this species have only been reported from one site on the Daniel Boone National Forest, which is a conifer-dominated stand composed of mature white pines and hemlock and less mature deciduous hardwoods.(L. Perry, pers. obs.).

Yellow-throated Vireo – *Vireo flavifrons* – Extensive tracts of relatively mature woodland are necessary for this interior breeding bird. Large, deciduous trees within a variety of forest types, including mixed mesophytic cove, pine-oak, and oak hickory upland forest, are favored. Isolated or much-dissected tracts are avoided; however, the bird will tolerate a certain amount of disturbance (from fire, selective logging) without being dramatically affected (Palmer-Ball, 1996). Rather, activities that serve to result in a fairly open midstory/understory can be beneficial, as the birds' frequent trees within relatively open settings. Yellow-throated vireos on the Daniel Boone National Forest are often observed in mixed pine-hardwood stands that have been burned or had midstory reduction (L.Perry, pers. obs.). This species would be attracted primarily to the hardwood component on this habitat association. Forested habitats that have developed an open understory, generally thru repeated burning, would be expected to support this species and most often, on the Daniel Boone National Forest, these are mixed pine-oak sites.

Insects

Appalachian Grizzled Skipper – *Pyrgus wyandot* – In Kentucky, Appalachian grizzled skipper is only known from eastern shale barrens in Harlan County. Elsewhere it is known to occur in open areas near woods, including valley bottoms, barrens, meadows, grassy hillsides and scrub oak openings. Its food sources include wild strawberry, Canadian cinquefoil, blueberry, and plants belonging the rose family.

Diana Fritillary – *Speyeria diana* – On the Daniel Boone, Diana fritillary is found in open areas and within the forest especially those that are open and well-lit. These conditions mimic open prairies and pine barrens from which the species is known out west and may be found along grassland/forest edge or in forests that have been maintained in an open condition by repeated fires. The caterpillar feeds almost exclusively on violets and winters above-ground, making them sensitive to spring and fall fires. Midstory removal and prescribed fire can create high quality foraging habitat for adults by increasing nectar sources. A variety of species are used, including common and swamp milkweeds, ironweed, red clover, coneflowers and butterfly bush. Individuals will use small openings and roadsides along forest edges in search of nectar plants, but do not go far from the woods.

Regal Fritillary – *Speyeria idalia* – The regal fritillary was once considered common in the natural grasslands, pastures and wet meadows of the northeastern United States. In the mid-west, fire-maintained oak-pine barrens supplied significant amounts of habitat for the regal fritillary. Food sources include violets, milkweeds, thistles, and other nectar producers. This species is now considered to be extirpated from Kentucky.

Reptiles

Northern Coal Skink – *Eumeces anthracinus anthracinus* – The Appalachian population of this subspecies extends into eastern Kentucky, while a disjunct population occurs in the west-central part of the state. Suitable habitat includes damp forests of oak, oak-poplar, oak-hickory-pine, and mixed pine-hardwood with moist soils, abundant leaf litter, logs, and/or loose stones; humid wooded or rocky hillsides; rocky bluffs; and similar areas near water sources, such as streams, springs, swamps, and bogs. These skinks seek the cover of rocks, logs, stumps, brush, and rock slabs. When pursued, they will take refuge in shallow water, hiding under rocks at the bottom. Various rocky areas in which they have been found include: on limestone ledges; in dry leaves beneath rock ledges; beneath flat slabs of sandstone; under rocks in sunlit forest openings and in grassy cut over areas in hardwoods; and under rocks in the slope of a road cut through a mixed forest (VA Dept. of Game and Inland Fisheries 2001). Use of fire to maintain grassy openings within forested stands is of benefit to this species. Coal skinks feed primarily on insects and spiders.

Southern Five-lined Skink – *Eumeces inexpectatus* – The southern five-lined skink ranges from Virginia south to the Florida Keys, and westward to the Mississippi River. This skink is most abundant in dry habitats, such as pine clearings, beaches, ridge tops and well-drained, sandy places. This species has been documented around man-made structures, field and wood edges, urban woodlots, dry pine forests, mixed pine-hardwood forests, early stages of lowland pine communities and sawdust piles. (Virginia website.) This skink is considered terrestrial and

arboreal. The southeastern five-lined skink diet consists of a variety of arthropods. (Wilson, 1995)

Eastern Slender Glass Lizard – *Ophisaurus attenuatus longicaudus* – This is a species of dry, often sandy, soil conditions. It occurs in relatively open, typically upland, habitats--including Virginia and shortleaf pine and pine-oak stands, forest edges, grassy fields and prairies--which have loose, friable soils. This secretive, legless lizard tends to stay in old rodent burrows and under mats of dead grass and decomposing plants; when it basks in the sun, it is often hidden in tall grass or with only part of its body showing (VA Dept. of Game and Inland Fisheries 2001). slender glass lizard diets include insects, spiders, birds' eggs, smaller lizards, and snakes. Prescribed burning and other management practices that help to create open canopy conditions benefit this lizard species.

Northern Pine Snake – *Pituophis melanoleucus melanoleucus* – Pine snakes inhabit dry, sandy pine and pine-oak forest types with open canopies and patchy to dense ground cover. Eastern Kentucky sites are typically upland or ridgetop, whereas, at lower elevations, the snakes utilize pine flatwoods and sandhill areas. Forest openings with scattered areas of well-drained sand and little shrub cover are required for nesting and hibernation sites (NatureServe, 2001). These secretive snakes spend much of their time in burrows, emerging to hunt for small mammals, birds and eggs; they climb trees well. Loose or friable soil is needed, since the snakes excavate their own burrows as well as use those made by small mammals. This species requires a relatively large area in which to forage (Wilson 1995). Management practices, including midstory control and prescribed burning, which serve to promote and maintain barrens-like conditions—open stands with well-lit, grassy understories—are necessary to support the species.

Southeastern Crowned Snake – *Tantilla coronata* – The southeastern crowned snake ranges from southcentral Virginia and southern Illinois to the Florida panhandle and eastern Louisiana. This secretive snake is an excellent burrower, spending much of its time concealed in rotting logs, under bark, stones, leaf litter, pine needles, or burrowed in the soil. The southeastern crowned snake apparently prefers relatively xeric, well-drained soils in pine flatwoods, sandhills and dry hillsides. This snake requires dry habitats with friable soil and sufficient debris for shelter. Females deposit eggs in rotting logs or sawdust piles. The southeastern crowned snake's diet consists of centipedes, spiders, termites, and other small, soft-bodied arthropods. (Wilson, 1995).

PLANTS

Dicots

Eastern Silvery Aster – *Aster concolor* – This aster is a coastal plain species where it is found in pine savannas. On the Daniel Boone National Forest, it is found in open yellow pine or yellow pine-oak forest that has a sparse midstory and a grass-forb ground layer. It is also found in and at the edge of warm season grassland areas, including powerline rights-of-way. It requires high light conditions and benefits from the application of fire to its habitat.

American chestnut -- *Castanea dentata* – American chestnut is far less common today than it

once was. A fungal disease introduced from Asia in 1904 decimated the species in about 30 years. The species sprouts prolifically and sprouts are still found through its range. American chestnut once dominated much of what is now upland oak forest. On what is now Daniel Boone National Forest land, American chestnut was found on narrow sandstone and conglomerate ridges along the edge of the escarpment and in the Redbird area. It was associated with chestnut oak. Scarlet and black oaks replaced it on these sites. Today, on the Daniel Boone National Forest, sprouts are common to scarce on upper slopes and ridges near the escarpment and on portions of the Redbird District. The species grows on acid soils that are generally poor, dry, and located on sites subject to fire. It is believed that fire promoted the species.

Chinquapin – *Castanea pumila* (generic) – The chinquapin occurs in upland hardwood forest. It is usually found on dry sites, and usually under a partially open canopy. On the Daniel Boone National Forest, the species occurs as variety *pumila*. Species-habitat relationships are discussed for this variety below.

Allegheny Chinquapin – *Castanea pumila* var. *pumila* – This variety is found in dry upland oak or oak-yellow pine forests. It usually occurs where midstory and shrub layers are sparse, or the canopy is open. The species is at least somewhat adapted to fire, sprouting readily after fire. It may respond to fire in the way American chestnut and oaks do.

Scarlet Indian Paintbrush -- *Castilleja coccinea* – Scarlet Indian paintbrush is found in warm season grasslands, open upland hardwood or pine forest and occasionally along roadsides. The species requires moderate to high levels of light. It responds favorably to fire, which helps to maintain the species habitat.

Small-flowered Thoroughwort -- *Eupatorium semiserratum* – Small-flowered thoroughwort is a coastal plain species that extends into prairie regions and open forest of the Cumberland Plateau. It is rare in Kentucky and known only from one location on the Daniel Boone National Forest. Here it occurs in an open area in an oak-yellow pine forest on well-drained soil.

Box Huckleberry – *Gaylussacia brachycera* – This huckleberry is a central Appalachian species. It occurs in upland yellow pine and yellow pine-oak woods. Yellow pine is present in or adjacent to all sites on the Daniel Boone National Forest. It is also found on sandstone glades and in the upland portions of utility rights-of-way. The species appears to require well-drained, sandy soils. Box huckleberry will grow in closed canopy (yellow pine) conditions if the midstory and shrub layers are more or less absent. On the Daniel Boone National Forest, the densest, and apparently the healthiest populations, are found in these sites. It also grows under more open canopy conditions where it is tolerant of thicker midstory and shrub layers. The rhizomes are positioned at the transition between the duff and mineral soil. Fire maintains the general habitat in which it grows. The species is top killed by fire, but does resprout, at least if the duff layer is not removed. Recovery appears to be slower than for other *Gaylussacia* species or *Vaccinium* species, but with the proper interval and intensity of fire, populations should be maintained while enhancing habitat.

Red-disked Sunflower -- *Helianthus atrorubens* – This sunflower is a southern and prairie species commonly occurring in warm season grassland. It also is found in open yellow pine

forest. On the Daniel Boone National Forest, this species is most abundant in warm season grassland. This habitat in powerline rights-of-way holds most of the Daniel Boone National Forest population. Scattered plants and clumps are found in open yellow pine and yellow pine-oak forest. Fire enhances flowering of this species and maintains its habitat.

Smooth Veiny Peavine – *Lathyrus venosus* – This is widespread in eastern North America. It is often found in open dry forest, but may also be found in moist mesic or terrace forest, and sometimes on stream banks. On the Daniel Boone National Forest, it is found in dry-mesic oak and mixed mesophytic forest, often near gaps or other areas of higher light levels.

Carolina Anglepod – *Matelea carolinensis* – This is a coastal plain species with range extensions along the southern Appalachian Plateaus. It grows in moist, open forest, either yellow pine or hardwood, and in sandy old fields and waste areas. On the Daniel Boone National Forest, the single station is on a sandy roadside adjacent to open yellow pine-oak forest.

American Cow-wheat – *Melampyrum lineare* (generic) – American cow wheat has a taxonomy somewhat confused with numerous uses by various authors. Following Medley (1993), only the var. *pectinatum* is likely to present on the Daniel Boone National Forest. Specimens not identified to variety from the Daniel Boone National Forest area are assumed to be this variety. Habitat details are described below for the variety.

American Cow-wheat -- *Melampyrum lineare* var. *pectinatum* – This variety has been carried as var. *lineare* on the Daniel Boone National Forest based on a literature citation. Medley (1993) argues against this and places all plants in the Daniel Boone National Forest area in var. *pectinatum*. This is a coastal plain species. It is found in sandy, open yellow pine forest. On the Daniel Boone National Forest, the sole station for the species is from ridgetop dry-xeric oak and oak-yellow pine forest.

Sweet Pinesap – *Monotropsis odorata* – Sweet pinesap is a central and southern Appalachian provinces species. It is saprophytic, gaining carbohydrate nutrients from associations with soil fungi. The species appears to be associated with ericaceous shrubs and or yellow pine in dry forest. It is usually found in or at the base of dense thickets of *Rhododendron maximum*, *R. catawbiense*, or *Kalmia latifolia*, usually with yellow pine, but sometimes with upland oaks. Populations on the Daniel Boone National Forest are found in similar habitat with the exception of one or two which are moist micro-habitat associated with shaded cliffs. Fire likely is important to the maintenance of the community in which *Monotropsis* lives and is unlikely to harm the species as it occurs mostly underground except for flowering.

Gaywings – *Polygala pauciflora* – Gaywings is a northern species with extend range through the southern Appalachians. It is found in rich moist forest. On the Daniel Boone National Forest, one station is known from a mesic ravine in oak-hardwood forest.

Racemed Milkwort – *Polygala polygama* var. *polygama* – This milkwort has a midwestern and coastal plain distribution. It is usually found on dry, sandy soil in open forest or grassland. The Daniel Boone National Forest sites are on sandy soil in open, ridge top, yellow pine-oak forest or sandy, grassy openings.

Hairy Snout Bean – *Rhynchosia tomentosa* (var. *tomentosa*) – Hairy snout bean is found throughout most of the southeastern US. It grows in dry, open, often sandy, oak or yellow pine forest, at forest margins, in sandhills, and occasionally in mesic forest. The Daniel Boone National Forest sites are all in warm season grassland, or low disturbed vegetation along roads or under powerline rights-of-way.

Slender Marsh-pink – *Sabatia campanulata* – This is coastal plain species found in salt or brackish marshes. It occurs inland in a few areas. The Daniel Boone National Forest sites are from wet meadows.

American Chaffseed – *Schwalbea americana* – American chaffseed occurs in two general kinds of habitats, wet and dry. In all cases, soils are sandy and somewhat sterile. In wet habitats, the combination of constant water and periodic fire maintain the site in an open condition. The overstory is open as are the midstory and shrub layers beneath it. Generally wet sites are grassy with few shrubs. Periodic fire helps to maintain the open condition of the sites. It also plays a role in triggering flowering. This habitat type is not known from the Daniel Boone National Forest. Dry habitats likewise are open with a thin overstory and open midstory and shrub layers. These sites are generally a mixture of forbs, grasses, and low shrubs. Some dry habitats are subjected to periodic burns, which help to maintain the open condition. Fire here also helps to trigger flowering. In other dry habitats, the openness is more edaphically controlled. The historic sites on the Daniel Boone National Forest fall into this group. Here fire would have triggered flowering. Other dry Daniel Boone National Forest sites could, with periodic fire, support *Schwalbea* populations.

Big-flowered Snowbell – *Styrax grandiflorus* – Big-flowered snowbell is a southern Appalachian Mountains and southeastern coastal plain species. It commonly grows in mixed or deciduous forest in upland locations. There is at least one reliable record for the species in Kentucky from the Daniel Boone National Forest area (McCreary County). Here it is growing in mixed mesophytic forest on a north aspect above the Cumberland River.

Spiked Hoary-pea – *Tephrosia spicata* – Spiked hoary pea is a southern species with a number of more northern stations. It is commonly found in dry to wet, open yellow pine or yellow pine-hardwood forest, roadsides, clearings and fields. On the Daniel Boone National Forest, the species is found on boulder/cobble bars along larger streams and rivers of the Cumberland River drainage. A few sites are known from sandy, sparsely shaded openings on ridges.

Bird's-foot Violet -- *Viola pedata* - Bird's foot violet occurs in dry, well-drained soils. On the Daniel Boone NF, it is most frequently encountered along sandy roadbanks and slopes in open yellow pine or yellow pine-oak forests. High light levels appear to be required by the species. The species also occurs in dry, upland pastures or grassy slopes that have thin vegetation.

Gymnosperms

Ground Juniper – *Juniperus communis* var. *depressa* – Ground juniper is a northern species whose range extends into the southern Appalachians. It occurs on rocky sites, in the open or under open canopy. On the Daniel Boone National Forest, the two known sites occur on

sandstone cliff tops, rooted in rocky soil in areas of open canopy. Fire may have a detrimental effect on the species.

Pitch Pine – *Pinus rigida* – Pitch pine ranges from New England to the Appalachian Mountains. It grows in generally sterile, sandy soil where it competes well against many other woody species. These soils are usually dry, but may be moist. The cones are semi-serotinous, opening following hot fires or occasionally very hot days. Fire also prepares a seedbed advantageous to the light seeds. On the Daniel Boone NF, this species is most commonly found within a few hundred feet of sandstone cliffs. The soils here are sandy, thin and usually dry providing the conditions under which the species competes. These areas also would have been subject to periodic burning, aiding regeneration of the species.

Liverworts

Liverwort – *Nowellia curvifolia* – This liverwort is widespread in northern North America, south into the Appalachian provinces, present in the high mountains of Mexico and Central America. It is found almost exclusively on decorticated logs. On the Daniel Boone National Forest, it is found almost exclusively on decorticated eastern hemlock and yellow pine logs, usually of 10-12 inch diameter or larger. It requires moderate to heavy shade.

Monocots

Grass-pink – *Calopogon tuberosus* – Grass pink is a coastal plain species found in wet to moist pine savannas, roadside ditches, pitcher plant bogs, and other open, wetland habitats. A few historic Kentucky stations occurred in dry, sandy soil on ridgetops under open oak or oak-yellow pine forest. On the Daniel Boone National Forest, a few extant stations are known from streamhead wetlands, slope seeps or wet warm season grassland. It may have occurred on drier sites in the past. The species requires constant moisture and more or less open conditions.

Doughnut or Boott's Sedge -- *Carex picta* – This sedge is scattered across the forest. It grows in clumps, which over time, spread outward while dying in the center, leaving a doughnut-shaped ring. It was considered uncommon throughout its range until rare plant surveys on the Daniel Boone National Forest located many populations. Most of these populations are small with a few plants, but a few are large (0.4-1 ha, 1-2.5 ac). The species appears to survive in heavy shade, but does poorly. It does best under an open canopy with little midstory on slopes. This habitat is probably maintained by fire, especially since the plant appears to promote fire. The leaves contain a volatile oil, which readily allows even green leaves to burn, and old leaves form a loose mound of fine fuels around the plants.

Appalachian Spreading Pogonia – *Cleistes bifaria* – The Appalachian spreading pogonia ranges from the Appalachian Plateaus to the Piedmont. It is found in a variety of sites ranging from glades to open forest to warm season grassland to streamhead wetlands. It occurs on well-drained substrates (on hummocks in wetlands) usually in open or partially open conditions. The plants can be single or occur in colonies. On the Daniel Boone National Forest, it is known from glades, streamhead wetlands, seep slopes, and on road cuts in upland oak forest. Fire enhances flowering and total numbers of plants. Fire probably helps to maintain habitat as well.

Spotted Coralroot – *Corallorhiza maculata* – Spotted coralroot is mostly a northern species with extensions into the Appalachian Mountains. Its habitat is hardwood forest, but occurs under a variety of conditions. In Kentucky, it is known only from Pine Mountain within the Daniel Boone National Forest proclamation boundary. It occurs on dry-mesic oak-hardwood forest in rich soil.

Pink Lady's-slipper – *Cypripedium acaule* – Across its range, pink lady's-slipper occurs in acid forests or wetlands (usually sphagnum bogs). On the Daniel Boone National Forest, pink lady-slipper is found in upland oak and mixed pine-oak woods, and occasionally on hummocks within seeps and streamhead wetlands. It occurs in light to heavy shade, but does not seem to flower unless in somewhat open conditions. This species responds well to burning. It is not uncommon to find 3 to 4 dozen plants in flower and as many more in vegetation condition following a fire where only a dozen or so were found before. The species is experiencing collection pressure from root diggers. Digging of this species is not permitted on the Daniel Boone National Forest.

Bearded Skeleton Grass – *Gymnopogon ambiguous* – Bearded skeleton grass is a coastal plain species that generally occurs in dry, sandy, open forest. It may also occur in open grassland. On the Daniel Boone National Forest, it occurs in open warm season grassland and open, sandy ground with or without light forest cover.

Wood Lily – *Lilium philadelphicum* var. *philadelphicum* – Wood lily occurs from New England to North Carolina and Kentucky. It is found in open, usually dry forest or in open fields or warm season grass areas. On the Daniel Boone National Forest, it is known from open yellow pine-oak forest, roadsides, warm season grassland, and old fields. It requires open conditions and is soon choked out by heavy cover of herbaceous or woody species. Fire maintains its habitat and promotes the plant.

Mosses

Dog Paw Moss or Elegant Moss – *Dicranum scoparium* – This moss is found throughout most of eastern North America. It is relatively common on shaded sandstone boulders, outcrops and cliffs. It also occurs on soil in upland forest. It appears to require moderate shade and acid conditions, but will live in moist to dry environments. The species is often subject to fire and frequently portions of clumps are burned, but not the entire clump. The species is collected for the horticultural industry. It may serve as a refugium for some species during fire events, and act as water reservoir and soil stabilizer following fire.

References:

- Baker, M.D. and Michael J. Lacki. 1997. Short-term changes in bird communities in response to silvicultural prescriptions. *Forest Ecol. and Manag.* 96: 27-36.
- Barbour R.W. 1971. *Amphibians and reptiles of Kentucky*. The University Press of Kentucky. Lexington, KY.
- Behler, J.L. and F.W. King. 1979. *The Audubon Society field guide to North American reptiles and amphibians*. Alfred A. Knopf. New York, NY.

- Buehler, D.A., and C.P. Nicholson. 1997. Ecology of the Cerulean Warbler in the Cumberland Mountains and the Southern Appalachians. 1996 Annual Report. Department of Forestry, Wildlife and Fisheries, University of Tennessee. Knoxville, TN.
- Conant, R. and J.T. Collins. 1991. Peterson field guide to reptiles and amphibians: Eastern and Central North America. 3rd ed. Houghton Mifflin. Boston, MA.
- DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and rangeland birds of the United States - natural history and habitat use. U.S. Department of Agriculture Handbook 688. 625 pp.
- Hamel, Paul B. 1992. Land manager's guide to birds of the south. The Nature Conservancy, Southeastern Region. Chapel Hill, NC. 437 pp.
- Medley, M.E. 1993. An annotated catalog of the known or reported vascular flora of Kentucky. Unpublished dissertation. University of Louisville. Louisville, KY. [A reset, reduced type copy from TNC/KSNPC].
- Mengel, R.M. 1965. The birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press. Lawrence, KS. 581 pp.
- Murphy, G.A. 1980. Status, nesting habitat, foraging ecology, and home range of the Red-cockaded Woodpecker (*Picoides borealis*) in Kentucky. Unpublished thesis. Eastern Kentucky University. Richmond, KY.
- NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Association for Biodiversity Information, Arlington, VA. Available: <http://www.natureserve.org/>. (Accessed: July 25, 2001).
- Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky. Lexington, KY. 372 pp.
- Perry Mills, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest.
- Salvage Harvest due to 1998 Storm Damage. Draft Environmental Impact Statement. Daniel Boone National Forest. November 1999.
- Stearns Ranger District. Personal Observations.
- Wilson, L.A. 1995. Land manager's guide to the amphibians and reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and the U.S. Forest Service, Southern Region. Atlanta, GA.
- VA Dept of Game and Inland Fisheries: VA Fish and Wildlife Information Service. 2001. Available: <http://www.dgif.state.va.us/>. (Accessed July 26, 2001).

07/15/2003

Attachment C.

Dry-Mesic Mixed Pine-Oak Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
7-Dry-Mesic Mixed Pine-Oak	Dry-Mesic Mixed Pine-Oak Forest	(blank)	BIRD	Chuck-will's widow/ <i>Caprimulgus carolinensis</i>
				Eastern wood pewee/ <i>Contopus virens</i>
				Red-cockaded Woodpecker/ <i>Picoides borealis</i>
				Red-breasted Nuthatch/ <i>Sitta canadensis</i>
			INSEC	Regal Fritillary/ <i>Speyeria idalia</i>
			P-DIC	Chinquapin (generic)/ <i>Castanea pumila</i>
				Small-flowered Thoroughwort/ <i>Eupatorium semiserratum</i>
				Smooth Veiny Peavine/ <i>Lathyrus venosus</i>
				Carolina Anglepod/ <i>Matelea carolinensis</i>
				Cow-wheat/ <i>Melampyrum lineare</i>
				American Cow-wheat/ <i>Melampyrum lineare</i> var. <i>pectinatum</i>
				Big-flowered Snowbell/ <i>Styrax grandiflorus</i>
		Acidic Substrate	P-MON	Pink Lady-slipper/ <i>Cypripedium acaule</i>
			REPT	Scarlet Kingsnake/ <i>Lampropeltis triangulum elapsoides</i>
				Southeastern Crowned Snake/ <i>Tantilla coronata</i>
			P-DIC	Racemed Milkwort/ <i>Polygala polygama</i> var. <i>polygama</i>
			P-GYM	Ground Juniper/ <i>Juniperus communis</i> var. <i>depressa</i>
			P-MON	Pink Lady-slipper/ <i>Cypripedium acaule</i>
			P-MOS	Dog Paw Moss, Elegant Moss/ <i>Dicranum scoparium</i>
			P-GYM	Ground Juniper/ <i>Juniperus communis</i> var. <i>depressa</i>
				Pitch Pine/ <i>Pinus rigida</i>
		Aspect (SE to NW)	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
			BIRD	Acadian flycatcher/ <i>Empidonax virescens</i>
				Ovenbird/ <i>Seiurus aurocapillus</i>
				Worm-eating warbler/ <i>Helminthos vermivorus</i>
				Wood Thrush/ <i>Hylocichla mustelina</i>
				Swainson's Warbler/ <i>Limnithlypis swainsonii</i>
				Kentucky warbler/ <i>Oporornis formosus</i>
				Ovenbird/ <i>Seiurus aurocapillus</i>
		Downed Logs	REPT	Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
				Southeastern Crowned Snake/ <i>Tantilla coronata</i>
		Downed Logs (minimum size)	P-LIV	Liverwort/ <i>Nowellia curvifolia</i>
		Drainage Good	INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>
			REPT	Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
		Drainage Poor	INSEC	Regal Fritillary/ <i>Speyeria idalia</i>
		Dry	BIRD	Chuck-will's widow/ <i>Caprimulgus carolinensis</i>

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Summer tanager/ <i>Piranga rubra</i>
				Ovenbird/ <i>Seiurus aurocapillus</i>
			P-DIC	Eastern Silvery Aster/ <i>Aster concolor</i>
				Spiked Hoary-pea/ <i>Tephrosia spicata</i>
				Bird's-foot Violet/ <i>Viola pedata</i>
			P-MON	Boott's Caric Sedge/ <i>Carex picta</i>
				Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i>
				Pink Lady-slipper/ <i>Cypripedium acaule</i>
				Bearded Skeleton Grass/ <i>Gymnopogon ambiguus</i>
		Elevation (above 2300 ft)	BIRD	Blackburnian warbler/ <i>Dendroica fusca</i>
				Least flycatcher/ <i>Empidonax minimus</i>
				Red-breasted Nuthatch/ <i>Sitta canadensis</i>
			P-DIC	Gaywings/ <i>Polygala pauciflora</i>
		Ericaceous Shrub Associate	INSEC	Diana Fritillary/ <i>Speyeria diana</i>
			REPT	Northern Coal Skink/ <i>Eumeces antracinus antracinus</i>
				Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
				Northern Pine Snake/ <i>Pituophis melanoleucus melanoleucus</i>
		Fire Dependent	BIRD	Red-cockaded Woodpecker/ <i>Picoides borealis</i>
			REPT	Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
				Northern Pine Snake/ <i>Pituophis melanoleucus melanoleucus</i>
		Fire Tolerant/Enhanced	BIRD	Bachman's Sparrow/ <i>Aimophila aestivalis</i>
				Pine warbler/ <i>Dendroica pinus</i>
				Least flycatcher/ <i>Empidonax minimus</i>
				Red-headed woodpecker/ <i>Melanerpes erythrocephalus</i>
				Red-cockaded Woodpecker/ <i>Picoides borealis</i>
				Summer tanager/ <i>Piranga rubra</i>
				Yellow-throated vireo/ <i>Vireo flavifrons</i>
			INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>
				Regal Fritillary/ <i>Speyeria idalia</i>
			P-MON	Boott's Caric Sedge/ <i>Carex picta</i>
		Forb/Grass Condition	BIRD	Bachman's Sparrow/ <i>Aimophila aestivalis</i>
				Chipping sparrow/ <i>Spizella passerina</i>
			INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>
		Forest Interior (Minimal Edge)	BIRD	Sharp-shinned Hawk/ <i>Accipter striatus</i>
				Cerulean Warbler/ <i>Dendroica caerulea</i>
				Yellow-throated Warbler/ <i>Dendroica dominica</i>
				Blackburnian warbler/ <i>Dendroica fusca</i>
				Worm-eating warbler/ <i>Helmitheros vermivorus</i>
				Swainson's Warbler/ <i>Limnithlypis swainsonii</i>
				Ovenbird/ <i>Seiurus aurocapillus</i>
				Yellow-throated vireo/ <i>Vireo flavifrons</i>
		High Shade		Worm-eating warbler/ <i>Helmitheros vermivorus</i>
			P-DIC	Sweet Pinesap/ <i>Monotropsis odorata</i>

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
		Large Decadent Trees	BIRD	Sharp-shinned Hawk/ Accipiter striatus
				Eastern wood pewee/ Contopus virens
				Red-cockaded Woodpecker/ Picoides borealis
		Large Decadent Trees	BIRD	Yellow-throated Warbler/ Dendroica dominica
		Leaf Litter		Worm-eating warbler/ Helminthos vermivorus
				Ovenbird/ Seiurus aurocapillus
			REPT	Southern Five-lined Skink/ Eumeces inexpectatus
				Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Mature forest	BIRD	Sharp-shinned Hawk/ Accipiter striatus
				Eastern wood pewee/ Contopus virens
				Cerulean Warbler/ Dendroica caerulea
				Yellow-throated Warbler/ Dendroica dominica
				Blackburnian warbler/ Dendroica fusca
				Pine warbler/ Dendroica pinus
				Red-headed woodpecker/ Melanerpes erythrocephalus
				Kentucky warbler/ Oporornis formosus
				Red-cockaded Woodpecker/ Picoides borealis
				Summer tanager/ Piranga rubra
				Red-breasted Nuthatch/ Sitta canadensis
		Mid-age Forest		Eastern wood pewee/ Contopus virens
				Pine warbler/ Dendroica pinus
				American redstart/ Setophaga ruticilla
		Moderate Shade	P-DIC	Sweet Pinesap/ Monotropsis odorata
		Moderate Shade	P-MON	Wood Lily/ Lilium philadelphicum var. philidelphicum
		Moist	BIRD	Worm-eating warbler/ Helminthos vermivorus
				Wood Thrush/ Hylocichla mustelina
				Kentucky warbler/ Oporornis formosus
			P-DIC	Sweet Pinesap/ Monotropsis odorata
			P-MON	Grass-pink/ Calopogon tuberosus
				Appalachian Spreading Pogonia/ Cleistes bifaria
				Spotted Coralroot/ Corallorhiza maculata
		Old Growth Condition	BIRD	Red-cockaded Woodpecker/ Picoides borealis
		Open (Little or No Shade)		Summer tanager/ Piranga rubra
			INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
			P-DIC	Purple False Foxglove/ Agalinus decemloba
				Red-disked Sunflower/ Helianthus atrorubens
				Racemed Milkwort/ Polygala polygama var. polygama
			P-MOS	Dog Paw Moss, Elegant Moss/ Dicranum scoparium
		Open Forest Canopy	BIRD	Pine warbler/ Dendroica pinus
				Least flycatcher/ Empidonax minimus
				Red-headed woodpecker/ Melanerpes erythrocephalus
				Summer tanager/ Piranga rubra
				Chipping sparrow/ Spizella passerina
			BIRD	Yellow-throated Warbler/ Dendroica dominica

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
			INSEC	Diana Fritillary/ <i>Speyeria diana</i>
			P-DIC	Allegheny Chinquapin/ <i>Castanea pumila</i> var. <i>pumila</i>
			P-MON	Boott's Caric Sedge/ <i>Carex picta</i>
				Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i>
				Wood Lily/ <i>Lilium philadelphicum</i> var. <i>philadelphicum</i>
			REPT	Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i>
				Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
				Northern Pine Snake/ <i>Pituophis melanoleucus melanoleucus</i>
		Open Midstory/Understory	BIRD	Bachman's Sparrow/ <i>Aimophila aestivalis</i>
				Chuck-will's widow/ <i>Caprimulgus carolinensis</i>
				Eastern wood pewee/ <i>Contopus virens</i>
				Cerulean Warbler/ <i>Dendroica caerulea</i>
				Acadian flycatcher/ <i>Empidonax virescens</i>
				Red-cockaded Woodpecker/ <i>Picoides borealis</i>
				Summer tanager/ <i>Piranga rubra</i>
				Ovenbird/ <i>Seiurus aurocapillus</i>
				Yellow-throated vireo/ <i>Vireo flavifrons</i>
			INSEC	Diana Fritillary/ <i>Speyeria diana</i>
			P-DIC	Box Huckleberry/ <i>Gaylussacia brachycera</i>
			P-MON	Boott's Caric Sedge/ <i>Carex picta</i>
			REPT	Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i>
				Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
				Northern Pine Snake/ <i>Pituophis melanoleucus melanoleucus</i>
		Rich Soil	P-DIC	American Chestnut/ <i>Castanea dentata</i>
			P-MON	Spotted Coralroot/ <i>Corallorhiza maculata</i>
		Riparian	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
		Rocky/Rocks	P-GYM	Pitch Pine/ <i>Pinus rigida</i>
			REPT	Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
				Southeastern Crowned Snake/ <i>Tantilla coronata</i>
		Sandy Soil	INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>
			P-DIC	Eastern Silvery Aster/ <i>Aster concolor</i>
				Racemed Milkwort/ <i>Polygala polygama</i> var. <i>polygama</i>
				Hairy Snout Bean/ <i>Rhynchosia tomentosa</i>
				Slender Marsh-pink/ <i>Sabatia campanulata</i>
				American Chaffseed/ <i>Schwalbea americana</i>
			P-GYM	Pitch Pine/ <i>Pinus rigida</i>
			P-MON	Grass-pink/ <i>Calopogon tuberosus</i>
			REPT	Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
		Shrub/Sapling Condition	BIRD	Prairie warbler/ <i>Dendroica discolor</i>
				Least flycatcher/ <i>Empidonax minimus</i>
				Ovenbird/ <i>Seiurus aurocapillus</i>
				American redstart/ <i>Setophaga ruticilla</i>
				Chipping sparrow/ <i>Spizella passerina</i>
			INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
			REPT	Southern Five-lined Skink/ Eumeces inexpectatus
		Slope (hillside, steepness)	BIRD	Worm-eating warbler/ Helminthos vermivorus
				Ovenbird/ Seiurus aurocapillus
		Snags > 6" dbh		Red-headed woodpecker/ Melanerpes erythrocephalus
		Tract Size (Area Sensitive)		Acadian flycatcher/ Empidonax virescens
				Cerulean Warbler/ Dendroica caerulea
				Yellow-throated Warbler/ Dendroica dominica
				Pine warbler/ Dendroica pinus
				Worm-eating warbler/ Helminthos vermivorus
				Swainson's Warbler/ Limnolophus swainsonii
				Ovenbird/ Seiurus aurocapillus
		Tree and Snags (Cavity Nesters)		Red-headed woodpecker/ Melanerpes erythrocephalus
				Red-cockaded Woodpecker/ Picoides borealis
		Trees > 20" dbh		Cerulean Warbler/ Dendroica caerulea
				Yellow-throated Warbler/ Dendroica dominica
				Blackburnian warbler/ Dendroica fusca
		Upland (usually mesic to dry, not subject to holding water)	BIRD	Chipping sparrow/ Spizella passerina
				Yellow-throated Warbler/ Dendroica dominica
				Ovenbird/ Seiurus aurocapillus
				Yellow-throated vireo/ Vireo flavifrons
			REPT	Southeastern Crowned Snake/ Tantilla coronata
		Water (Distance Sensitive)	BIRD	Acadian flycatcher/ Empidonax virescens
				American redstart/ Setophaga ruticilla

Viability Assessment Report For Dry-Xeric Mixed Pine-Oak Habitat Association

Prepared by
Lynda Mills and Tim Reed
Daniel Boone National Forest

I. Description of Habitat Association

The Dry-Xeric Mixed Pine-Oak Habitat Association occurs throughout the Daniel Boone National Forest (DBNF). It is fairly well proportioned across the forest with the exception of the Redbird district, which contains few acres of this association. While more evenly distributed from south to north than other pine and mixed pine-hardwood associations, the majority of this association does occur on the southern portions of the forest. The London, Somerset and Stearns districts contain approximately 66 percent of the total acres found on the forest. This habitat association can be found in several land type associations (LTAs) but it is most common in the Southern Cliff (221Hc003), Rockcastle Hills (221Hc005), London-Corbin Plain (221Hc006) and Big South Fork Plateau (221Hc004). It is also relatively common in the Central Cliff (221Hb002), London-Corbin Plain Transition (221Hc007) and along the Northern Escarpment (221Hb004) LTAs (USDA Forest Service, 1997a).

On the DBNF this habitat association is typical of dry, sandstone ridgetops, along margins of sandstone cliffines and on the upper portions of southwesterly facing slopes. This habitat association typically occurs on broad to narrow ridge tops or slopes with a southerly or westerly exposure (SAMAB, 1996). Most sites are sandstone or shale-based and on acidic soils, primarily on sites with moisture or nutrient deficiencies. Xeric site conditions may exist due to: (1) low precipitation, (2) limited moisture absorption/retention because of exposed bedrock, steep slopes, coarse-textured soils, rocky solids, or shallow soils and/or (3) elevated evapotranspiration rates on southern-facing slopes (USDA Forest Service, 1997). Because lack of precipitation is not normally a factor on the DBNF, these xeric conditions are likely the result of items 2 and/or 3. Rocky south facing slopes and ridgetops with shallow soils and/or exposed rock are common attributes of xeric sites on the DBNF. Xeric sites are often associated with high landscape positions (Jones, 1988).

This association is a mix of yellow pine and hardwood species. Depending on the site conditions and past disturbance history, yellow pine species will comprise 31 to 69 percent of the dominant overstory. The ratio of pine and hardwood species is largely a product of past disturbance regimes. The presence of hardwoods dominating many mixed stands is likely due to the absence of a historic disturbance regime and changes in land use on the forest in the past 75 to 100 years. Whereas past disturbance caused by Native American burning, frequent wildfires, and historic use of these sites for farming, grazing, or heavy timber harvest may have encouraged the regeneration of shade-intolerant oaks and pines, more recent events such as the suppression of fires and succession of grazed and farmed areas to mature forest has favored shade-tolerant hardwoods other than oaks.

Overstory species that commonly occur in this habitat association include: Virginia pine, pitch pine, shortleaf pine, scarlet oak, chestnut oak, black oak, post oak, pignut hickory, and blackgum (and historically, American chestnut). Other species that may be found in the overstory or as midstory include: sourwood, red maple, sassafras, and eastern red cedar. Most shrubs are typically ericaceous and lowbush blueberry, huckleberry, and deerberry are particularly fond of xeric conditions (SAMAB, 1996; Jones, 1988).

II. Current Status of the Habitat Association on the Daniel Boone National Forest

Prior to the 2000-2001 southern pine beetle (SPB) epidemic, the DBNF had approximately 29,353 acres of forest area that was considered in the Dry-Xeric Mixed Pine-Oak Habitat Association (USDA Forest Service, 1998). This represented over 4 percent of the total forested area on the DBNF. However, assuming that approximately 75 to 90 percent of the pine component has been killed as a result of the SPB epidemic, it is more likely that < 1 percent of the total forested area on the DBNF is now in this habitat association. In 1998, approximately 54 percent (15,749 acres) of this was greater than 70 years old. The age class less than 30 years old comprised approximately 12 percent (3,623 acres) of this association.

The pine-hardwood group Virginia pine-scarlet oak typically dominates this habitat association on the DBNF. However, in 1998, over 74 percent of the acres classed in this association were typed as hardwood-pine. Today, it is likely that much more than 74 percent (due to the recent pine mortality) is likely to fall within hardwood-pine forest types.

Most of the mixed pine-oak stands that fall within this habitat association contain little or no advanced oak or pine regeneration in the midstory or understory. This is likely a result of fire-suppression and other disturbances that would allow adequate light to reach the understory layer and stimulate oak and pine regeneration. As a result, the midstory layer of these stands is composed of high densities of species such as dogwood, sourwood, and red maple. The understories of these stands are generally completely shaded and contain shade-tolerant shrubs and herbaceous plants.

On the southern portion of the forest where this association occurred in major quantities, or graded into other pine dominated associations, it was typically included in management strategies for the endangered red-cockaded woodpecker (RCW). Mature Virginia pine-oak stands, were considered suitable foraging areas. Virginia Pine is not considered well suited for nesting habitat but is utilized in that regard. Much of this association occurs in sites that are low in timber productivity due to site nutrient deficiencies. These sites would not normally be targeted for timber production.

The devastation from the SPB epidemic has caused the loss of the yellow pine component in many of these formerly mixed pine-oak stands and will transform formerly mixed stands to sites dominated by hardwoods. Today, most of these sites would not be classified as mixed forest types because they do not contain at least 30 percent live yellow pine. This habitat association currently consists primarily of young regeneration areas not yet impacted by the SPB and small, scattered areas of mature to mid-age mixed pine-hardwood stands that are quickly being transformed into hardwood-dominated areas.

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

A. Purpose and Need for Management of Dry-Xeric Pine-oak Communities

Recognition and management of mixed pine-hardwood types can produce a number of benefits. Since the DBNF occurs within the range of several hardwood and yellow pine species, many sites on the forest are well-suited to providing conditions conducive to growing healthy stands of both yellow pine and desirable hardwoods. As a result, many sites in the forest have likely been historically composed of a mix of pine and hardwood species. This in-stand diversity of tree species composition, which provides a mix of conifers and deciduous hardwoods, has resulted in a high diversity of plants and animals within these stands. Many of these wildlife and plant species (including those in Attachment A) find suitable conditions within these stands because they are attracted to either the yellow pine or the deciduous hardwood component of these stands, or in many cases, to the disturbance regime (often, fire) that often maintains the mixed pine-oak stand composition.

Within the Dry-Xeric Mixed Pine-Oak Habitat Association, the following conditions are needed to ensure persistence of some species identified in Attachment A:

Acidic substrate	Elevations above 2300'	Leaf Litter	Open Canopy	Snags > 6" dbh
Burrows, Holes, and Tunnels	Dry Conditions	Mature Forest	Open Midstory/Understory	Trees with Cavities
Dense Shrub Understory	Periodic burning	Mid-age Forest	Riparian Areas	Water nearby
Downed Logs	Large Decadent Trees	Open (Little or no Shade)	Rocky areas	Large tracts of suitable habitat
Good Drainage	Minimal forest edge/Interior Habitat	Moist Conditions	Sandy Soils	
Upland Areas	Old Growth Conditions	Shrub/Sapling Conditions	Trees > 20" dbh	

Many of these conditions (such as sandy soils, slope, drainage) are factors of geology and topography and not normally influenced by standard forest management activities. Where forest management activities may influence these conditions, however, standards and guidelines are presented in this analysis to ensure that these conditions continue to be present within the Dry-Xeric Mixed Pine-Oak Habitat Association in order to ensure the persistence of species identified in Attachment A.

B. Desired Future Condition

AGE CLASS

To provide for the greatest diversity and meet requirements of all species listed in Attachment A, a variety of age classes within this habitat association is recommended. The conditions represented by these various age classes provide important habitat conditions for the species listed in Attachment A. For example, maintaining a component

of this habitat association in the 0 to 10 year old age class would provide for species that require patches of bare ground, thickets, briars, vines and forbs, whereas, a 10 to 30 year old component would better serve species that require taller, more dense, woody, shrubby early successional habitat. Species that simply require brushy conditions, regardless of stem density or type would be provided by both the 0 to 10 year and 10 to 30 year component of this habitat association. Species that only prefer a component of this habitat association in a forested condition that is dominated by trees of varying heights and densities but do not require older trees for mast production and cavities or snags would need a component of this habitat association greater than 20 years of age. Species most dependent upon mature stands that provide cavity trees, large snags, and production of acorns and pine seed would be best provided for by maintaining a component of this habitat association greater than 80 years of age.

However, it is also recognized that the DBNF is currently well below the desired levels of 20 plus year old mixed forest types and has an unbalanced age class distribution of mixed forest types as a result of the SPB epidemic. The desired age class distribution is based upon the viability needs of all the species in Attachment A and would ensure persistence of all these species within the dry-xeric pine-oak community (assuming other recommendations made in this analysis are implemented). However, because of the SPB epidemic, it will be impossible to achieve this desired age class distribution within the next planning period. The age class distribution over the next planning period is more likely to reflect an increase in the 0 to 10 year old age class and a decrease in the 20 plus year old age class for this habitat association. **As a result, the age class distribution expected over the next planning period is not likely to provide for short term persistence of all these species on the DBNF, particularly those species that require large tracts of mature pine-dominated forest.**

Desired age class distribution of dry-xeric pine-oak habitat:

Desired Successional Class	percent desired in pine-hardwood forest types*	percent desired in hardwood-pine forest types*
Forest 0-10 years of age	~3 percent (1998-pre SPB levels)	~5 percent (1998 levels-pre SPB)
Forest 0-30 years of age	~12 percent (1998-pre SPB levels)	~13 percent (1998-pre SPB levels)
Forest 20-80 years of age	~82 percent (1998-pre SPB levels)	~48 percent (1998-pre SPB levels)
Forest 80 plus years of age	~14 percent (1998-pre SPB levels)	~43 percent (1998-pre SPB levels)

*Rationale for using 1998 levels: Monitoring of some species that are identified in Appendix A (primarily birds) immediately before, during and after 1998 did not reveal any significant declines of these species during that time period, therefore, it is assumed that age class distributions that existed during that time period were adequate in ensuring persistence of these species on the forest and within this Habitat Association.

This desired age class distribution will provide for the following habitat conditions within the Dry-Xeric Mixed Pine-Oak Habitat Association: Dense shrub understory, large decadent trees, mature forest, mid-age forest, old growth conditions, shrub/sapling conditions, and trees > 20" dbh.

OVERSTORY

The overall landscape composition of the DBNF is based upon many influences. Based upon existing forest structure and needs of species identified in Attachment A, the desired forest composition of dry-xeric pine-oak habitat is as follows:

Desired level of DBNF that will be in a dry-xeric pine-hardwood forest type	1.1 percent 1998 1 percent likely in 2001 (-3.5 percent) 1-3 percent desired
Desired level of DBNF that will be in a dry-xeric hardwood pine forest type	3.3 percent 1998 < 1 percent likely in 2001 (plus 3.5 percent) 2-4 percent desired
Total desired level of DBNF that will be in a dry-xeric pine-oak Habitat Association	4.4 percent in 1998 < 1 percent likely in 2001 2-4 percent desired

These desired levels are based upon the assumption that the recommendations outlined in this analysis are implemented. Implementation of these recommendations will help assure persistence of the species identified in Attachment A.

MIDSTORY AND UNDERSTORY

It is desired that mixed pine-oak stands be somewhat self-sustaining. This will require the use of techniques, primarily burning and thinning, that will encourage advanced pine and oak regeneration in the understory and create a somewhat open midstory. The use of these techniques will likely create a midstory that contains species such as dogwood, sourwood, sassafras and blackgum and an understory of sedges, grasses, grapes, bracken fern, ericaceous shrubs such as huckleberries and blueberries, and mountain laurel. In the less xeric pine-oak sites, the midstory and understory would be expected to be less open and likely to contain more shade-tolerant species such as red maple with an understory dominated more by deciduous shrubs and herbaceous plants.

General Strategy to be Used to Meet Desired Future Conditions (DFC):

The general strategy that should be taken to achieve the Desired Future Condition is to implement future management that will favor oak in existing or historical hardwood-pine stands and pine in existing or historical pine-hardwood stands. This may lead to some stands becoming >70 percent hardwood or pine and being reclassified as upland hardwood forest types or southern yellow pine types rather than "mixed" forest types. An exception to this will likely occur in cases where existing and historical hardwood-pine sites are contiguous with areas being managed for species that require large tracts of pine forest. Where the latter occurs, many of these hardwood-pine sites may be managed towards pine-hardwood types (50-69 percent pine) or will maintain their hardwood-pine classification.

C. Habitat Association General Direction and Standards and Guidelines

Forest-wide

General Direction: Create healthy dry-xeric pine-oak communities.

- Emphasize prescribed fire use in mixed forest types.
 - *Rationale: Extensive research has shown that both the pine and oak components of pine-oak stands respond favorably to somewhat open conditions created by burning and the reduction of less fire tolerant woody competition. Open conditions created by burning also benefit species identified in Attachment A that require an open midstory/ understory, or are fire dependent/enhanced, and helps maintain an ericaceous and/or forb grass condition in the understory.*
- Implement periodic maintenance burns, including during the growing season to control undesirable woody vegetation in mixed forest types. (RCW FEIS).
 - *Rationale: Growing season burns will likely be the most effective in reducing undesirable hardwood stem density in the understory.*
- Consider restoration of American chestnut in sites that lend themselves to this objective.
 - *Rationale: American chestnut was historically a species dominant in the overstory of this Habitat Association.*
- Provide downed logs and large woody debris on the forest floor where this may be limited naturally.
 - *Rationale: Some species require the presence of down logs on the forest floor within this habitat association and where the presence of down logs is not provided due to natural events or as a result of forest management activities, there should be an attempt made at restoring this habitat condition.*

General Direction: Maintain or restore shortleaf or pitch pine dominance within existing and historical pine-hardwood stands. Maintain Virginia pine dominance on pine-hardwood sites that are less suitable for shortleaf or pitch pine.

- *Rationale: Ensuring a pine dominance in pine-hardwood stands will contribute to the overall availability of yellow pine across the landscape in levels that will provide for the persistence of species that are restricted or dependent upon the presence of stands of pines and other conifers. Shortleaf and pitch pines are the desirable pine species because they are longer lived than Virginia pine and can provided habitat for species associated with the dry-xeric pine-oak community over a longer period of time than Virginia pine-oak sites may provide. However, often Virginia pine is the only pine species that does well on xeric sites and so, in some cases, this species will be preferred.*

- Where pine-hardwood stands are considered not adequately stocked to maintain a >50 percent pine overstory dominance, implement management that will increase the pine stocking in the understory using a variety of methods such as controlled burning, planting, releasing advanced regeneration, and other methods that may be applicable.
 - *Rationale: Stands that contain less than 50 percent pine overstory would not be considered pine-hardwood forest types. It is important to maintain a pine dominance in some of these mixed stands in order to provide for species that require contiguous pine habitat and for species that are restricted to pines for foraging purposes (such as red-cockaded woodpecker). Periodic burning will produce a better seedbed for pine regeneration and limit competition from species that are less tolerant of burning than pines. Also improves habitat for fire-tolerant/enhanced species. If burns are conducted prior to pine seed dispersal, there is a greater chance that seed will fall on a site where it can successfully sprout and remain viable. If burning cannot occur during this time, then burns should focus on limiting the amount of non-desirable sprouts within the pine-hardwood stands in order to maintain pine dominance in these sites. Once pine stocking levels in the understory become adequate, controlled burning should be curtailed to allow pine seedlings time to grow. Once pine stocking in the understory reaches the desired level to maintain a >50 percent pine dominance, burning should be curtailed so that young seedlings have a chance to grow without being killed back by other burns. Pine regeneration generally needs to be released from hardwood competition, especially in mixed sites.*
- Conduct site prep activities that will provide the best results for desired pine regeneration such as implementing spring to early summer felling of non-desirable residuals that are > 5 feet tall and allowing felled residuals to be allowed to dry until early to mid-July before burning (Phillips and Abercrombie, 1987). Consider use of herbicides or low intensity burning treatments to release pine seedlings.
 - *Rationale: Site prep at this time will coincide with timing for better site prep burns and follow-up planting. Allowing residuals to "cure" for a few months will improve the effectiveness of a follow-up site prep burn. Studies show that burning after July 1 has the greatest effectiveness on preparing a site for planting that following winter and maximizes the consumption of residual slash on the ground that could impede planting efforts and successful pine regeneration. By planting after the burn, planting is easier to do and the seedlings have less competition from other species. Also, planting in the winter and early spring is the best time for seedlings to get established. Following planting, some sites may need follow-up treatments to ensure that pine seedlings are not out-competed by less desirable species.*
- A variety of regeneration methods may be used to restore or regenerate pine-hardwood forest types, the most appropriate of which is to be determined by site-specific objectives and needs.

- *Rationale: Regeneration of some pine-hardwood forest types will provide habitat for those species that require early successional forest as well as interior forest edge conditions.*
- Unless Virginia pine is the only native yellow pine species likely to dominate a site, all healthy shortleaf and pitch pines should be retained during stand restoration activities, unless their density is greater than 70 square feet of basal area (BA), in which case the desired trees should be thinned to improve pine regeneration in the understory and improve the health of the stand. (RCW FEIS)
 - *Rationale: "Restoration" implies that a shortleaf and pitch pine composition will be restored to the site. If there is already a component of this desired species in the stand, it should be retained, where it may provide a natural seed source, etc., unless its retention hampers further restoration of the site to a desired pine-hardwood type*
- Maintain a pine BA of 40-110 square feet, depending on site and stand condition and site objectives
 - *Rationale: Depending upon objectives for the site, the BA may be relatively low (40-50 BA if the site is managed as a pine-oak barrens, for instance) or it may be relatively high (80-110 BA if the site is being managed to provide dense conifer cover, or is in regeneration and densely stocked). An average BA of 40-110 (around 70 BA) would be desired in the majority of pine-hardwood sites. A range of basal areas will also provide stands with a variety of shade conditions across the landscape.*

General Direction: Maintain or restore an oak component within existing and historical hardwood-pine stands.

- *Rationale: Maintaining an oak component in these stands will ensure persistence of those plant and animal species that require the hardwood component of a mixed forest type, particularly oak, as well as species that require leaf litter on the forest floor.*
- A variety of regeneration methods and site prep techniques may be used to restore or regenerate desired oak species while maintaining a mixed pine-oak composition, the most appropriate of which is to be determined by site-specific objectives and needs.
 - *Rationale: Regeneration of some hardwood-pine forest types will provide habitat for those species that require early successional forest as well as interior forest edge conditions.*
- 1. Even-aged management is generally the preferred regeneration method for regenerating oaks in mixed forest types.
 - *Rationale: Studies indicate that oaks require high amounts of sunlight for successful regeneration, and these conditions are best provided in even age*

management areas. Even-aged management will provide habitat for species that require larger stands (generally >10 acres) of early successional forest habitat and for species that occupy areas with dense shrub understories .

- a) Clearcutting is the preferred method where advanced oak regeneration is present (Thompson and Dessecker, 1992).
 - *Rationale: Studies have shown that clearcutting on mesic hardwood-dominated sites often accelerates the site towards a mixed mesophytic community because more mesic sites generally have less advanced oak regeneration in the understory than drier sites. Drier sites generally have a greater accumulation of natural oak reproduction in the understory, which is favored by clearcutting.*
- b) Shelterwoods are preferred where advanced oak regeneration is not present (Thompson and Dessecker, 1992).
 - *Rationale: Shelterwoods are more useful on mesic sites that have less advanced oak regeneration in the understory because it controls stand density near the end of rotation when oak reproduction needs to accumulate.*

- 2. Uneven age management may be considered where even aged management does not meet site objectives.

- *Rationale: Implementing uneven aged management may allow for regeneration of pine-oak sites while still maintaining some of the overstory and some of the attributes of mature stands. Generally, however, uneven aged management does not provide many of the attributes of early successional habitat. Uneven-aged management may provide for species that will persist in small areas (generally < 2 acres) of early successional forest or for species that require some overstory trees with an early successional, dense, shrubby understory.*

- a) **Group selection** cuts may be used providing that group selection cut openings are at least 1/10 of an acre in size (depending upon amount of advanced oak regeneration on site) (Thompson and Dessecker, 1992).
 - *Rationale: Creating openings will provide necessary light to facilitate growth of advanced oak reproduction in these sites as long as openings fall within 1/10 – 1/2 acre in size. Larger openings should be referred to as patch cuts or clearcuts.*

- 3. Controlled burning should be timed for early fall immediately preceding acorn seed dispersal from the overstory. Otherwise, burns should be conducted at times when maximum bud and sprout mortality of non-desirable hardwoods will occur.

- *Rationale: If burns are conducted prior to acorn dispersal, there is a greater chance that acorns will fall on a site where it can successfully sprout and remain viable. If burning cannot occur during this time, then burns should focus on limiting the amount of non-desirable sprouts within the hardwood-pine stands in order to maintain oak dominance in these sites.*
- 4. Retain some mature oaks in regeneration stands to sustain acorn production.
 - *Rationale: Retaining mature oaks in regeneration stands will provide for species that feed on acorns and prefer mature oaks in a very sparse, open canopy condition and will also provide a natural seed source for oak regeneration.*
- 5. Reduce competition from non-desirable hardwood species thru a variety of methods such as controlled burning and/or herbicide use. This may be especially necessary on sites that have a Site Index > 70 for black oak (Schlesinger, 1993).
 - *Rationale: On hardwood-pine sites with higher site indices, there may be sufficient competition from other hardwood species to out compete the more desirable oak species. Burning, overstory release and herbicide use have all been shown to retard the development of competing non-oak saplings. Release, particularly overstory release, should be conducted when oak seedlings are at least 4.5 feet tall (Schlesinger 1993). Studies show that oaks of less than 4.5 feet tall generally are not big enough to out compete other nondesirable hardwood saplings in a site.*

General Direction: Provide large cavity trees and snags in mature dry-xeric pine-oak communities.

- *Rationale: For some species identified in Appendix A, the presence of large cavity trees and snags in the dry-xeric pine-oak community is necessary for their persistence within that community.*
- Establish rotation ages that will ensure that mature, heartrotted, and large diameter yellow pines and oaks are provided on the landscape.
 - *Rationale: By increasing the rotation age, a supply of old, decadent, heartrotted pines and oaks should be available for species that require these kinds of trees for nesting, foraging or perching. This standard will maintain the presence of large decadent trees and trees with cavities on the landscape.*
- Existing pine and pine-hardwood stands of desirable pine type will not be regenerated until they reach rotation age, but thinning may occur in these stands. If regeneration of pine and pine-hardwood types is necessary to help achieve a balanced age class, regeneration may occur, but not in the oldest 1/3 of pine and pine-hardwood stands.

- *Rationale: By retaining the oldest 1/3 of pine and pine-hardwood stands, species that require mature pine-dominated forest and older, mature pines should be provided for.*
- Provide artificial cavities and nest boxes for species that may be limited by cavity availability.
 - *Rationale: Artificial cavities and nest boxes can provide nesting and roosting habitat for species that may be limited by the unavailability of snags and den trees within the dry-xeric pine-oak communities.*
- Retain existing snags in project areas except where they would interfere with project purpose and need.
 1. No snags will be intentionally felled within project areas associated with timber management.
 - *Rationale: This will insure that deliberate attempts to reduce the snag component within timber management areas will not occur.*
 2. Within project areas, at least three snags per acre at least 9" dbh will be retained.
 - *Rationale: This will help insure that larger diameter snags >6" dbh will be provided in project areas that fall within dry-xeric pine-oak forest types.*
 3. Live trees will be girdled if the existing density of standing dead trees does not meet this standard.
 - *Rationale: This will provide suitable snags in areas where snag availability may be limited.*
 4. Snags considered to be immediate threats to human safety may be removed anytime. Those identified as immediate hazards should be removed during the Indiana bat hibernation season.
 - *Rationale: This will protect species that may be using snags for breeding purposes.*

LONDON, SOMERSET AND STEARNS

General Direction: Provide contiguous pine-dominated habitat for forest-interior pine-dependent species on the London, Somerset and Stearns Districts.

- *Rationale: Some species require large tracts of contiguous interior pine dominated habitat. Habitat requirements for these species would be best met on the London, Somerset and Stearns District because the southern part of the forest provides the greatest numbers of sites suitable for restoration and/or maintenance of the dry-xeric pine oak community.*

- Emphasize pine management in existing and/or historical hardwood-pine stands that are on the south end of the forest and are determined to be important links necessary for maintaining continuity of large tracts of contiguous pine dominated habitat.
 - *Rationale: Where habitat for species requiring contiguous pine dominated habitat in large tracts, the conversion of hardwood-pine sites to pine-hardwood sites should be considered since often, these hardwood-pine sites are located adjacent to pine dominated stands and contain suitable site characteristics that make them suitable for either pine or hardwood dominance.*
- Limit regeneration patch sizes in pine and pine-hardwood forest types:
 - *Rationale: Patch size on the south end of the forest within pine dominated forest types should be limited because the south end of the forest offers the best and only potential for providing habitat for species that require large tracts of interior mature pine dominated forest.*
 - 1. Regeneration patch size for *restoration* of pine or pine-hardwood forest types will not exceed 40
 - *Rationale: It is understood that for restoration purposes, there will be a need to accelerate regeneration of these forest types and increasing patch size is one method of doing that.*
 - 2. Regeneration within pine or pine-hardwood forest types for *non-restoration* purposes will not exceed 25 acres (RCW FEIS and current FLMP)
 - *Rationale: Limiting patch size will help maintain the continuity of mature pine-hardwood forest types.*
- Avoid creation of permanent or temporary barriers that inhibit or prevent movement of forest-interior pine-dependent species between areas of activity.
 - *Rationale: The creation of permanent and temporary barriers on the south end of the forest within pine dominated forest types should be limited because the south end of the forest offers the best and only potential for providing habitat for species that require large tracts of mature pine dominated forest and habitat for these species could be fragmented by the unlimited creation of permanent or temporary barriers.*
- Provide some overstory pine habitat within regeneration areas.
 - *Rationale: Because the south end of the forest offers the best and only potential for providing habitat for species that require large tracts of mature pine dominated forest, the retention of some pine habitat within the overstory of regeneration areas may provide for a mature pine component within these stands and mitigate the potentially fragmenting effects to mature pine dominated habitat*

that could occur were no mature pine overstory retained. This standard will also provide an open forest canopy condition within this habitat association.

- Regeneration areas where contiguous habitat for forest-interior pine-dependent species may be limited will retain 40 square feet of pine BA when it is available.
 - *Rationale: Maintaining a 40 BA of pine will maintain attributes of a mature pine-hardwood stand while also allowing stand regeneration.*
- 1. Trees retained should be selected in the following order:
 - relict trees,
 - other potential cavity trees,
 - *Rationale: Retention of these trees will ensure that trees most likely to develop heart-rot and provide habitat for cavity dependent species are provided.*
 - other trees > 10" that represent the best seed producers (RCW FEIS)
 - *Rationale: Retention of these trees will provide the best natural seed source for the stand to be regenerated.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

There are basically no species listed in Attachment A that would fail to persist on the DBNF if the Dry-Xeric Pine-Oak Habitat Association was not maintained on the Forest, as long as Southern Yellow Pine and Dry-Xeric Oak Habitat Associations are provided. Because the DBNF is a hardwood-dominated forest overall, those species identified in Attachment A that are attracted to the hardwood component of dry-xeric pine-oak habitats would not likely be greatly affected by loss of this habitat association on the Forest. However, the presence of pine and open, fire-maintained habitat is a more limiting factor on the DBNF and many species would persist in much lower numbers on the DBNF if the sites recommended in this analysis for pine-hardwood management were converted to hardwood-dominated systems or were not maintained by some level of burning. For this reason, it is recommended that species that are most dependent upon the pine and fire component of this habitat association be monitored. Those species are:

Pine warbler, Red-cockaded woodpecker, Pitch pine

The two bird species are currently being monitored on an annual basis through the DBNF's implementation of the Southern National Forests' Migratory and Regional Landbird Conservation Strategy, as well as thru the use of roadside point counts and it is recommended that this monitoring be given high priority and allowed to continue to ensure our awareness of persistence of these species. Currently, the DBNF monitors the presence of pitch pine and other tree species in its ongoing CISC and it is recommended that this be given high priority and continue on a regular basis.

The condition of the dry-xeric pine-oak community should also be monitored by including attributes such as midstory density, understory description and condition, and a past history of stand treatments as part of the regular field inventory of stands. Conduct field inventories to gain data on a number of stand/site attributes such as soil conditions, slope, aspect, dominant and codominant stem densities, midstory and understory composition, and estimation of site quality. Utilize existing databases such as CISC, Forest Inventory, as well as GIS spatial data, aerial photographs, historical land use patterns, etc. Utilize Forest Service Ecological Classification System descriptions of Landtypes and Landtype Phases, which are based largely upon material outlined by Smalley (1983; 1984; 1986). Prior to making decisions that affect stand composition of individual sites on the forest, this information should be gathered to provide guidance as to what management decisions would be best for restoring or maintaining a dry-xeric pine oak community on a particular site, or in some cases, to justify management of the site for some other habitat association. This stand inventory monitoring would be given high priority.

Monitoring should also be conducted the summer following burning to determine natural pine and oak stocking as a result of burning activities. This monitoring may be given medium priority but will reveal whether or not the burn reached the objective of improving pine or oak viability in the site or had a negative effect upon the stand and its desired condition.

References:

- Jones, S. M. 1998. Old growth forests within the piedmont of South Carolina. *Natural Areas Journal* 8 (1): 31-37.
- Jones, S. M. 1998. Old growth forests within the piedmont of South Carolina. *Natural Areas Journal* 8(1): 31-37
- Phillips, D.R. and J. A. Abercrombie, Jr. 1987. Pine-hardwood mixtures-a new concept in regeneration. Reprinted from the *Southern Journal of Applied Forestry* 11(4): 192-197. November 1987
- SAMAB, Southern Appalachian Man and the Biosphere. 1996. The Southern Appalachian assessment terrestrial technical report. Report 5 of 5. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta, GA.
- Schlesinger, R.C., I.L. Sander, and K.R. Davidson. 1993. Oak regeneration potential increased by shelterwood treatments. *North. J. Appl. For.* 10(4): 149-153.
- Smalley, G.W. 1983. Classification and evaluation of forest sites on the Eastern Highland Rim and Pennyroyal. Gen. Tech. Report SO-43. U.S. Department of Agriculture, Forest Service, Southern Research Station. New Orleans, LA. 123 pp.
- Smalley, G.W. 1984. Classification and evaluation of forest sites in the Cumberland Mountains. Gen. Tech. Report SO-50. U.S. Department of Agriculture, Forest Service, Southern Research Station. New Orleans, LA. 84 pp.

- Smalley, G.W. 1986. Classification and evaluation of forest sites on the Northern Cumberland Plateau. Gen. Tech. Report SO-60. U.S. Department of Agriculture, Forest Service, Southern Research Station. New Orleans, LA. 74 pp.
- Thompson, F.R. and D. R. Dessecker. 1997. Management of early successional communities in central hardwood forests, with special emphasis on oaks, ruffed grouse, and forest songbirds. Gen. Tech. Report NC-195. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. St. Paul, MN.
- USDA Forest Service. 1998. Continuous inventory of stand condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 1997. Guidance for conserving and restoring old-growth forest communities on National Forests in the Southern Region – Report of the Region 8 Old-Growth Team. Forestry Report R8-FR 62. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA.
- USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 1998. Continuous inventory of stand condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

Attachment A.

Species List: Dry-Xeric Mixed Pine-Oak

Class	Common Name/ Species
ANIMALS	
Amphibians	Green Salamander/ <i>Aneides aeneus</i>
Birds	Sharp-shinned Hawk/ <i>Accipiter striatus</i> Bachman's Sparrow/ <i>Aimophila aestivalis</i> Chuck-will's Widow/ <i>Caprimulgus carolinensis</i> Eastern Wood-Pewee/ <i>Contopus virens</i> Cerulean Warbler/ <i>Dendroica caerulea</i> Prairie Warbler/ <i>Dendroica discolor</i> Yellow-throated Warbler/ <i>Dendroica dominica</i> Blackburnian Warbler/ <i>Dendroica fusca</i> Pine Warbler/ <i>Dendroica pinus</i> Least Flycatcher/ <i>Empidonax minimus</i> Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i> Red-cockaded Woodpecker/ <i>Picoides borealis</i> Summer Tanager/ <i>Piranga rubra</i> Ovenbird/ <i>Seiurus aurocapillus</i> Red-breasted Nuthatch/ <i>Sitta canadensis</i>
Reptiles	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i> Northern Pine Snake/ <i>Pituophis melanoleucus melanoleucus</i> Southeastern Crowned Snake/ <i>Tantilla coronata</i>
PLANTS	
Dicots	American Chestnut/ <i>Castanea dentata</i> Allegheny Chinquapin/ <i>Castanea pumila</i> var. <i>pumila</i> Sweet-fern/ <i>Comptonia peregrina</i> Box Huckleberry/ <i>Gaylussacia brachycera</i> Red-disced Sunflower/ <i>Helianthus atrorubens</i> American Cow-wheat/ <i>Melampyrum lineare</i> var. <i>pectinatum</i> American Chaffseed/ <i>Schwalbea americana</i> Spiked Hoary-pea/ <i>Tephrosia spicata</i>
Monocots	Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i> Pink Lady-slipper/ <i>Cypripedium acaule</i> Bearded Skeleton Grass/ <i>Gymnopogon ambiguus</i>
Mosses	Dog Paw Moss, Elegant Moss/ <i>Dicranum scoparium</i>

Attachment B.

Dry Xeric Mixed Pine-Oak Species/Habitat Relationships with References

ANIMALS

Amphibians

Green Salamander – *Aneides aeneus* – The green salamander lives in damp crevices in shaded rock outcrops and ledges. In cove hardwoods, this salamander can be observed under bark and cracks of trees (Gordan, 1967). In the general forested area, the green salamander occurs in mucky, boggy water among decaying leaves and logs around woodland streams and ponds (The Center for Biodiversity Studies, 2001). The green salamander has also been observed in upland pine areas, Virginia pine and white pine-hemlock with mountain laurel occupying the understory. Moist outcrops are required for egg depositing and larval development. (Wilson, 1995).

Birds

Sharp-shinned Hawk – *Accipiter striatus* – During the year, sharp-shinned hawks utilize both hardwoods and conifers and, in general, are most abundant in areas where a mixture of tree types exists. Although they are known to nest in hardwoods, birds in Kentucky seem to prefer evergreens for nesting and over-wintering and would be attracted to the evergreen pines in this habitat association during that period. A large, mature pine is a typical nesting site, provided it is within an extensive tract of forest. Although sharp-shinned hawks are observed (particularly when foraging) in areas having a mix of forested and semi-open habitat, they more frequently occur in forested tracts and are considered forest interior birds (Hamel, 1992).

Bachman's Sparrow – *Aimophila aestivalis* – This species typically requires dense grassy places where scattered trees or saplings are present, usually in pine forests (Hamel, 1992). Historically, it was found in mature to old growth southern pine woodlands subject to frequent growing-season fires (NatureServe, 2001). This provided the grassy undergrowth required by this species. This species formerly inhabited a variety of early successional habitats in Kentucky (Palmer-Ball, 1996). Bachman's sparrow would be particularly attracted to the pine component of the dry-xeric pine-oak forest as well as the open, frequently burned conditions of these forests.

Chuck-will's Widow – *Caprimulgus carolinensis* – This species tends to favor mixed oak and pine stands (DeGraaf et. al., 1991). It may occur and breed in general woods and forests that are primarily dry or mesic (Hamel, 1992). It appears to be much more common in drier forest where the understory and midstory levels are relatively open (Palmer-Ball, 1996). It typically feeds over adjacent fields and clearings (Hamel, 1992). Chuck-will's widow would be particularly attracted dry-xeric and open, frequently burned conditions of the dry-xeric pine-oak forest

Eastern Wood Pewee – *Contopus virens* – This species' preferred habitat is rather open mature woodland in a rather dry situation (Hamel, 1992). This species may be absent from younger, second growth forest where an open midstory has not yet developed. In such habitat they often frequent edges and road or stream corridors (Palmer-Ball, 1996). They typically utilize large deciduous trees for the nest site but may use conifers in mixed forest types. This species may be

found in numbers in most major forest types examined in Kentucky (Mengel, 1965). Eastern wood pewees would be particularly attracted to the hardwood component of the dry-xeric pine-oak forest as well as the open, frequently burned conditions of these forests.

Cerulean Warbler – *Dendroica caerulea* – This species would be primarily attracted to the hardwood component of mixed pine-oak stands. Cerulean warblers depend primarily on extensive tracts of mature, relatively undisturbed, deciduous forest. These birds occur in floodplains and upland sites that have large trees (> 20" dbh) in which to nest. Both nesting and foraging take place in the canopies of hardwoods. Stands are usually somewhat open, with little understory; however, according to Buehler and Nicholson (1997), monitoring data suggest that breeding territories in the Cumberland Mountains tend to have fewer canopy trees and greater shrub coverage than those elsewhere (1997). The birds are rarely found in tracts less than 250 hectares, whereas maximum population densities occur in tracts greater than 3000 ha (Buehler and Nicholson 1997). Hamel gives a minimum tract size of 1750 ha (1992).

Prairie Warbler – *Dendroica discolor* – Prairie warblers occur in semi-open, early successional, and woodland habitats. Mixed forest type, especially those that have been cut-over or burned, with pines and cedars are occupied. Forest edges, clearings, brushy borders, and overgrown fields with scattered saplings or small trees are commonly used. On the Daniel Boone National Forest, the birds are nearly always found in early successional habitat, especially young pine clearcuts, the undergrowth of shelterwood cuts, wood edges, and in stands that have been burned (L. Perry, pers. obs.).

Yellow-throated Warbler – *Dendroica dominica* – In some areas, hardwood-pine is used; however, birds on the Cumberland Plateau show a preference for pine (Mengel 1965) and the pine component of dry-xeric pine-oak forests is attractive to this species. Sites may range from moderately moist to dry/upland, provided the stands are rather open and have large trees (> 20" dbh). On the Daniel Boone National Forest, the birds are frequently observed in mature pine trees, and almost always observed in or near pines; they are frequently seen in stands with open canopies (L. Perry, pers. obs.).

Blackburnian Warbler – *Dendroica fusca* – The blackburnian warbler has a slight preference for forests of hardwoods mixed with hemlocks, spruce and fir (Hamel 1992). On the Daniel Boone National Forest, this species has only been encountered during periods of migration and would not be expected to breed on the Daniel Boone National Forest except in areas where elevations are greater than 3500', of which there are few of. This is a forest interior species of higher elevations, with most of the birds that are recorded in the Cumberland and Southern Appalachians occurring above 3500 feet (Hamel, 1992). A variety of coniferous and mixed forest types are utilized, with deciduous habitat being used to a greater extent in this southern part of the breeding range (DeGraaf et. al., 1991). Extensive tracts of mature forest, with large (> 20" dbh) nesting trees, are required (Hamel, 1992). This species may be particularly attracted to the evergreen pine component of mixed pine-hardwood stands during its migration.

Pine Warbler – *Dendroica pinus* – Pine warbler habitat consists of open to fairly dense stands of yellow pine and pine-hardwood. Although most numerous in extensive pine stands, the birds will use small stands of pine, as well (Mengel 1965). Suppression of fire has contributed to reduction

of pine in some areas (Palmer-Ball, 1996). Both middle-aged and mature stands are used; however, nesting is usually in mature pines.

Least Flycatcher – *Empidonax minimus* – This is a species of open conditions; it is rarely encountered deep in the forest. Open, deciduous woods (particularly those that have been disturbed by burning or logging), forest edge, fields with scattered large trees, and other habitats that provide early successional conditions are utilized. During spring migration, Mengel (1965) observed male birds in alders and willows in a marshy, Laurel County meadow. Most of the breeding population frequents elevations above 2500 feet. Least flycatchers would be particularly attracted to the hardwood component of the dry-xeric pine-oak forest as well as the open, frequently burned conditions of these forests.

Red-headed Woodpecker – *Melanerpes erythrocephalus* – Semi-open to open habitat with an abundance of large (> 14" dbh), dead trees is preferred for both breeding and wintering purposes. Relatively open, mature woods, swamps, clearings within mixed woodland, forest edges, and places where groves of trees are present, such as park-like settings, are commonly used. On the Daniel Boone National Forest, the birds are often observed in pine-dominated stands that have been frequently burned (L. Perry, pers. obs.). Nesting is in dead trees, or in dead limbs of live trees (Mengel 1965). This species generally avoids mature closed canopy forest during the breeding season (Palmer-Ball, 1996). The open, xeric conditions commonly found in this habitat association would be preferred by this species, as well as the oaks, which are used as a food source for the red-headed woodpecker.

Red-cockaded Woodpecker – *Picoides borealis* – Habitat for this species is generally thought of as being primarily open pine woods. Habitat is generally fairly mature forest with little or no midstory. The birds prefer conditions of minimal understory (Hamel, 1992). It is likely that the red-cockaded woodpecker used forests that were maintained by natural fires (Palmer-Ball, 1996). On the Daniel Boone National Forest this species seems to be attracted to open, frequently burned pine dominated stands where it selects live mature pine trees for nesting (L. Perry, pers. observation). These stands contain cavity trees that typically range in age from 90 to 128 years old and have an average diameter at breast height of 14.2-18.9 inches (Murphy, 1980). Due to southern pine beetle impacts to the primary habitat of this species, all known red-cockaded woodpeckers on the Daniel Boone National Forest were relocated out of state to suitable habitat in other populations.

Summer Tanager – *Piranga rubra* – Relatively dry sites, which tend to produce stands of a semi-open condition, are frequented by this species. Uplands are commonly used, but the birds may occur in a variety of habitats, including bottomlands and wooded residential areas. Forest types range from hardwood to pine-hardwood stands of open to medium density. On the Daniel Boone National Forest, the birds are frequently found in mature, mixed pine stands that have been burned and undergone midstory removal (L. Perry, pers. obs.). Oaks in open woodland or forest edge and often over open spaces such as roads and clearings are often chosen for nesting (Mengel 1965). Wild turkeys would be particularly attracted to the oak component of the dry-xeric pine-oak forest as well as the open conditions of these forests.

Ovenbird – *Seiurus aurocapillus* – Mature and second growth forest conditions are utilized, on dry to moderately moist sites with light to moderate understory. Ovenbirds are more common in

stands with closed canopies and open ground. This is a ground nesting species that forages in the leaf litter or on the soil. Mengel (1965) observed nests on logging roads and under small logs, sheltered by ferns, on steep, mesophytic slopes; however, Baker and Lacki (1997) note that birds are more abundant in non-harvested than in harvested areas. Upland stands and sloping terrain are preferred, but a variety of deciduous and mixed (e.g., pine-oak) forest types are used. This is a forest interior species having a minimum necessary tract size of 15 ha (Hamel, 1992). Ovenbirds would be particularly attracted to the hardwood component of the dry-xeric pine-oak forest as well as the open and somewhat drier conditions of these forests.

Red-breasted Nuthatch – *Sitta canadensis* – Though this nuthatch is dependent on coniferous habitat, its requirements vary considerably between seasons. It generally breeds at elevations above 3500 feet, in dead spruce or fir trees. Occasionally, it will nest in hemlock and, rarely, in pine. Suitable snags (dead trees) are greater than 6" dbh (six inch diameter at breast height). Mature stands are favored. The red-breasted nuthatch prefers to overwinter in dense stands of conifers and pine-oak and would be particularly attracted to the pine component of pine-oak forests during this time. During that time, the birds are not particular to age class so much as to stand density. On the Daniel Boone National Forest, when these birds are encountered in winter, it is almost always while feeding in pines—especially mature Virginia pines having a lot of cones (L. Perry, pers. obs.).

Reptiles

Eastern Slender Glass Lizard – *Ophisaurus attenuatus longicaudus* – This is a species of dry, often sandy, soil conditions. It occurs in relatively open, typically upland, habitats—including Virginia and shortleaf pine and pine-oak stands, forest edges, grassy fields and prairies—which have loose, friable soils. This secretive, legless lizard tends to stay in old rodent burrows and under mats of dead grass and decomposing plants; when it basks in the sun, it is often hidden in tall grass or with only part of its body showing (VA Dept. of Game and Inland Fisheries, 2001). Slender glass lizard diets include insects, spiders, birds' eggs, smaller lizards, and snakes. Prescribed burning and other management practices that help to create open canopy conditions benefit this lizard species.

Northern Pine Snake – *Pituophis melanoleucus melanoleucus* – Pine snakes inhabit dry, sandy pine and pine-oak forest types with open canopies and patchy to dense ground cover. Eastern Kentucky sites are typically upland or ridgetop, whereas, at lower elevations, the snakes utilize pine flatwoods and sandhill areas. Forest openings with scattered areas of well-drained sand and little shrub cover are required for nesting and hibernation sites (NatureServe, 2001). These secretive snakes spend much of their time in burrows, emerging to hunt for small mammals, birds and eggs; they climb trees well. Loose or friable soil is needed, since the snakes excavate their own burrows as well as use those made by small mammals. This species requires a relatively large area in which to forage (Wilson 1995). Management practices, including midstory control and prescribed burning, promote and maintain barrens-like condition (open stands with well-lit, grassy understories) and are necessary to support the species.

Southeastern Crowned Snake – *Tantilla coronata* – The southeastern crowned snake ranges from southcentral Virginia and southern Illinois to the Florida panhandle and eastern Louisiana. This secretive snake is an excellent burrower, spending much of its time concealed in rotting logs,

under bark, stones, leaf litter, pine needles, or burrowed in the soil. The southeastern crowned snake apparently prefers relatively xeric, well-drained soils in pine flatwoods, sandhills and dry hillsides. This snake requires dry habitats with friable soil and sufficient debris for shelter. Females deposit eggs in rotting logs or sawdust piles. The southeastern crowned snake's diet consists of centipedes, spiders, termites, and other small, soft-bodied arthropods. (Wilson, 1995).

PLANTS

Dicots

American Chestnut -- *Castanea dentata* – American chestnut is far less common today than it once was. A fungal disease introduced from Asia in 1904 decimated the species in about 30 years. The species sprouts prolifically and sprouts are still found through its range. American chestnut once dominated much of what is now upland oak forest. On what is now Daniel Boone National Forest land, American chestnut was found on narrow sandstone and conglomerate ridges along the edge of the escarpment and in the Redbird area. It was associated with chestnut oak. Scarlet and black oaks replaced it on these sites. Today on the Daniel Boone National Forest, sprouts are common to scarce on upper slopes and ridges near the escarpment and on portions of the Redbird District. The species grows on acid soils that are generally poor, dry, and located on sites subject to fire. It is believed that fire promoted the species.

Allegheny Chinquapin -- *Castanea pumila* var. *pumila* – The Allegheny chinquapin is found in dry upland oak or oak-yellow pine forests. It usually occurs where midstory and shrub layers are sparse, or the canopy is open. The species at least somewhat adapted to fire, sprouting readily after fire. It may respond to fire in the way American chestnut and oaks do.

Sweet Fern – *Comptonia peregrina* – Sweet fern is associated with open, sterile, sandy ground throughout most of its range, where it forms dense, low thickets. In this habitat, fires probably helped maintain the habitat. On the Daniel Boone National Forest, this species inhabits open cobble/boulder bars along free-flowing rivers. The plants are found rooted deep in the crevices between boulders. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition.

Box Huckleberry -- *Gaylussacia brachycera* – This huckleberry is a central Appalachian species. It occurs in upland yellow pine and yellow pine-oak woods. Yellow pine is present in or adjacent to all sites on the Daniel Boone National Forest. It is also found on sandstone glades and in the upland portions of utility rights-of-way. The species appears to require well-drained, sandy soils. *Gaylussacia* will grow in closed canopy (yellow pine) conditions if the midstory and shrub layers are more or less absent. On the Daniel Boone National Forest, the densest, and apparently the healthiest populations, are found in these sites. It also grows under more open canopy conditions where it is tolerant of thicker midstory and shrub layers. The rhizomes are positioned at the transition between the duff and mineral soil. Fire maintains the general habitat in which it grows. The species is top killed by fire, but does resprout, at least if the duff layer is not removed. Recovery appears to be slower than for other *Gaylussacia* species or *Vaccinium*

species, but with the proper interval and intensity of fire, populations should be maintained while enhancing habitat.

Red-disked Sunflower -- *Helianthus atrorubens* – This sunflower is a southern and prairie species commonly occurring in warm season grassland. It also is found in open yellow pine forest. On the Daniel Boone National Forest, this species is most abundant in warm season grassland. This habitat in powerline rights-of-way holds most of the Daniel Boone National Forest population. Scattered plants and clumps are found in open yellow pine and yellow pine-oak forest. Fire enhances flowering of this species and maintains its habitat.

American Cow-wheat -- *Melampyrum lineare* var. *pectinatum* – American cow wheat has been carried as var. *lineare* on the Daniel Boone National Forest based on a literature citation. Medley (1993) argues against this and places all plants in the Daniel Boone National Forest area in var. *pectinatum*. This is a coastal plain species. It is found in sandy, open yellow pine forest. On the Daniel Boone National Forest, the sole station for the species is from ridgetop dry-xeric oak and oak-yellow pine forest.

American Chaffseed – *Schwalbea americana* – American chaffseed occurs in two general kinds of habitats, wet and dry. In all cases, soils are sandy and somewhat sterile. In wet habitats, the combination of constant water and periodic fire maintain the site in an open condition. The overstory is open as are the midstory and shrub layers beneath it. Generally, wet sites are grassy with few shrubs. Periodic fire helps to maintain the open condition of the sites. It also plays a role in triggering flowering. This habitat type is not known from the Daniel Boone National Forest. Dry habitats likewise are open with a thin overstory and open midstory and shrub layers. These sites are generally a mixture of forbs, grasses, and low shrubs. Some dry habitats are subjected to periodic burns, which help to maintain the open condition. Fire here also helps to trigger flowering. In other dry habitats, the openness is more edaphically controlled. The historic sites on the Daniel Boone National Forest fall into this group. Here, fire would have triggered flowering. Other dry Daniel Boone National Forest sites could, with periodic fire, support *Schwalbea* populations.

Spiked Hoary-pea – *Tephrosia spicata* – Spiked hoary pea is a southern species with a number of more northern stations. It is commonly found in dry to wet, open yellow pine or yellow pine-hardwood forest, roadsides, clearings and fields. On the Daniel Boone National Forest, the species is found on boulder/cobble bars along larger streams and rivers of the Cumberland River drainage. A few sites are known from sandy, sparsely shaded openings on ridges.

Monocots

Appalachian Spreading Pogonia -- *Cleistis bifaria* – The Appalachian spreading pogonia ranges from the Appalachian Plateaus to the Piedmont. It is found in a variety of sites ranging from glades to open forest to warm season grassland to streamhead wetlands. It occurs on well-drained substrates (on hummocks in wetlands) usually in open or partially open conditions. The plants can be single or occur in colonies. On the Daniel Boone National Forest, it is known from glades, streamhead wetlands, seep slopes, and on road cuts in upland oak forest. Fire enhances flowering and total numbers of plants. Fire probably helps to maintain habitat as well.

Pink Lady's-slipper – *Cypripedium acaule* – The pink lady's-slipper occurs in acid forests or wetlands (usually sphagnum bogs) across its range. On the Daniel Boone National Forest, pink lady-slipper is found in upland oak and mixed pine-oak woods, and occasionally on hummocks within seeps and streamhead wetlands. It occurs in light to heavy shade, but does not seem to flower unless in somewhat open conditions. This species responds well to burning. It is not uncommon to find 3 to 4 dozen plants in flower and as many more in vegetation condition following a fire where only a dozen or so were found before. The species is experiencing collection pressure from root diggers. Digging of this species is not permitted on the Daniel Boone National Forest.

Bearded Skeleton Grass – *Gymnopogon ambiguous* – Bearded skeleton grass is a coastal plain species that generally occurs in dry, sandy, open forest. It may also occur in open grassland. On the Daniel Boone National Forest, it occurs in open warm season grassland and open, sandy ground with or without light forest cover.

Mosses

Dog Paw Moss or Elegant moss – *Dicranum scoparium* – This moss is found throughout most of eastern North America. It is relatively common on shaded sandstone boulders, outcrops and cliffs. It also occurs on soil in upland forest. It appears to require moderate shade and acid conditions, but will live in moist to dry environments. The species is often subject to fire and frequently portions of clumps are burned, but not the entire clump. The species is collected for the horticultural industry. It may serve as a refugium for some species during fire events, and act as water reservoir and soil stabilizer following fire.

References Cited:

Barbour R.W. 1971. Amphibians and reptiles of Kentucky. The University Press of Kentucky, Lexington, KY.

Behler, J.L. and F.W. King. 1979. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York.

Buehler, D.A., and C.P. Nicholson. 1997. Ecology of the Cerulean Warbler in the Cumberland Mountains and the Southern Appalachians. 1996 Annual Report. Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.

The Center for Biodiversity Studies. 2001. Western Kentucky University. A Web Application. Available: <http://biodiversity.wku.edu/information.htm>. Accessed September 19, 2001.

Conant, R. and J.T. Collins. 1991. Peterson field guide to reptiles and amphibians: eastern and central North America. 3rd ed. Houghton Mifflin, Boston.

DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and rangeland birds of the United States - natural history and habitat use. USDA Agriculture Handbook 688. 625 pp.

Gordan, R.E. 1967. *Aneides aeneus*. Cat. Amer. Amphib. Rept.: 30.1-30.2.

- Hamel, Paul B. 1992. Land manager's guide to birds of the south. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Medley, M.E. 1993. An annotated catalog of the known or reported vascular flora of Kentucky. Unpublished dissertation. University of Louisville. [A reset, reduced type copy from TNC/KSNPC].
- Mengel, R.M. 1965. The birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581 pp.
- Murphy, G.A. 1980. Status, nesting habitat, foraging ecology, and home range of the Red-cockaded Woodpecker (*Picoides borealis*) in Kentucky. Unpublished thesis. Eastern Kentucky University, Richmond, KY.
- NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Association for Biodiversity Information, Arlington, VA. Available: <http://www.natureserve.org/>. (Accessed: July 25, 2001).
- Palmer-Ball, B.L. 1996. The Kentucky breeding bird atlas. The University Press of Kentucky, Lexington, KY. 372 pp.
- Perry Mills, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest.
- Salvage harvest due to 1998 storm damage. Draft Environmental Impact Statement. Daniel Boone National Forest. November 1999.
- Stearns Ranger District. Personal Observations.
- VA Department of Game and Inland Fisheries: VA Fish and Wildlife Information Service. 2001. Available: <http://www.dgif.state.va.us/>. (Accessed July 26, 2001).
- Wilson, L.A. 1995. Land manager's guide to the amphibians and reptiles of the south. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and the U.S. Forest Service, Southern Region, Atlanta, GA.

07/15/2003

Attachment C.

Dry-Xeric Mixed Pine-Oak Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
8-Dry-Xeric Pine-Oak	Dry-Xeric Pine-Oak Forest	(blank)	AMPHI	Green Salamander/ Aneides aeneus
			BIRD	Chuck-will's widow/ Caprimulgus carolinensis
				Eastern wood pewee/ Contopus virens
				Red-cockaded Woodpecker/ Picoides borealis
				Red-breasted Nuthatch/ Sitta canadensis
			P-DIC	American Cow Wheat/ Melampyrum lineare var. pectinatum
			P-MON	Pink Lady-slipper/ Cypripedium acaule
		Acidic Substrate	P-MOS	Dog Paw Moss, Elegant Moss/ Dicranum scoparium
		Burrows, Holes, Tunnels (Secondary Users)	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
				Northern Pine Snake/ Pituophis melanoleucus melanoleucus
		Closed Forest Canopy	BIRD	Ovenbird/ Seiurus aurocapillus
		Dense shrub understory		Ovenbird/ Seiurus aurocapillus
		Downed Logs	REPT	Northern Pine Snake/ Pituophis melanoleucus melanoleucus
				Southeastern Crowned Snake/ Tantilla coronata
		Drainage Good		Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
				Northern Pine Snake/ Pituophis melanoleucus melanoleucus
		Dry	BIRD	Summer tanager/ Piranga rubra
				Ovenbird/ Seiurus aurocapillus
				Chuck-will's widow/ Caprimulgus carolinensis
			P-DIC	Spiked Hoary-pea/ Tephrosia spicata
			P-MON	Pink Lady-slipper/ Cypripedium acaule
				Bearded Skeleton Grass/ Gymnopogon ambiguus
			REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
				Southeastern Crowned Snake/ Tantilla coronata
		Elevation (above 2300 ft)	BIRD	Blackburnian warbler/ Dendroica fusca
				Least flycatcher/ Empidonax minimus
				Red-breasted Nuthatch/ Sitta canadensis
		Fire Dependent		Red-cockaded Woodpecker/ Picoides borealis
		Fire Tolerant/Enhanced		Bachman's Sparrow/ Aimophila aestivalis
				Pine warbler/ Dendroica pinus
				Least flycatcher/ Empidonax minimus
				Red-headed woodpecker/ Melanerpes erythrocephalus
				Red-cockaded Woodpecker/ Picoides borealis
		Forb/Grass Condition		Bachman's Sparrow/ Aimophila aestivalis
		Forest Interior (Minimal Edge)		Sharp-shinned Hawk/ Accipiter striatus
				Cerulean Warbler/ Dendroica caerulea
				Yellow-throated Warbler/ Dendroica dominica

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Ovenbird/ Seiurus aurocapillus
		Forest Interior (Minimal Edge)	BIRD	Blackburnian warbler/ Dendroica fusca
		Large Decadent Trees		Sharp-shinned Hawk/ Accipiter striatus
				Eastern wood pewee/ Contopus virens
				Yellow-throated Warbler/ Dendroica dominica
				Red-cockaded Woodpecker/ Picoides borealis
		Leaf Litter		Ovenbird/ Seiurus aurocapillus
			REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
				Southeastern Crowned Snake/ Tantilla coronata
		Mature forest	BIRD	Eastern wood pewee/ Contopus virens
				Cerulean Warbler/ Dendroica caerulea
				Yellow-throated Warbler/ Dendroica dominica
				Blackburnian warbler/ Dendroica fusca
				Pine warbler/ Dendroica pinus
				Red-headed woodpecker/ Melanerpes erythrocephalus
				Red-cockaded Woodpecker/ Picoides borealis
				Summer tanager/ Piranga rubra
				Red-breasted Nuthatch/ Sitta canadensis
		Mid-age Forest		Eastern wood pewee/ Contopus virens
				Pine warbler/ Dendroica pinus
		Old Growth Condition		Red-cockaded Woodpecker/ Picoides borealis
		Open (Little or No Shade)	BIRD	Summer tanager/ Piranga rubra
			P-DIC	Purple False Foxglove/ Agalinus decemloba
				Red-disked Sunflower/ Helianthus atrorubens
			P-MOS	Dog Paw Moss, Elegant Moss/ Dicranum scoparium
		Open Forest Canopy	BIRD	Yellow-throated Warbler/ Dendroica dominica
				Pine warbler/ Dendroica pinus
				Least flycatcher/ Empidonax minimus
				Red-headed woodpecker/ Melanerpes erythrocephalus
				Summer tanager/ Piranga rubra
			P-DIC	American Chestnut/ Castanea dentata
				Allegheny Chinquapin/ Castanea pumila var. pumila
				Red-disked Sunflower/ Helianthus atrorubens
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
			REPT	Northern Pine Snake/ Pituophis melanoleucus melanoleucus
				Southeastern Crowned Snake/ Tantilla coronata
		Open Midstory/Understory	BIRD	Bachman's Sparrow/ Aimophila aestivalis
				Chuck-will's widow/ Caprimulgus carolinensis
				Eastern wood pewee/ Contopus virens
				Cerulean Warbler/ Dendroica caerulea
				Red-cockaded Woodpecker/ Picoides borealis
				Summer tanager/ Piranga rubra

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
			P-DIC	Box Huckleberry/ Gaylussacia brachycera
			REPT	Northern Pine Snake/ Pituophis melanoleucus melanoleucus
		Riparian	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Rocky/Rocks		Southeastern Crowned Snake/ Tantilla coronata
				Northern Pine Snake/ Pituophis melanoleucus melanoleucus
		Sandy Soil	P-DIC	Sweet-fern/ Comptonia peregrina
				American Chaffseed/ Schwalbea americana
			REPT	Northern Pine Snake/ Pituophis melanoleucus melanoleucus
		Shrub/Sapling Condition	BIRD	Prairie warbler/ Dendroica discolor
				Least flycatcher/ Empidonax minimus
				Ovenbird/ Seiurus aurocapillus
		Slope (hillside, steepness)		Ovenbird/ Seiurus aurocapillus
		Snags > 6" dbh		Red-headed woodpecker/ Melanerpes erythrocephalus
		Tract Size (Area Sensitive)		Ovenbird/ Seiurus aurocapillus
				Pine warbler/ Dendroica pinus
				Cerulean Warbler/ Dendroica caerulea
				Yellow-throated Warbler/ Dendroica dominica
		Tree and Snags (Cavity Nesters)		Red-headed woodpecker/ Melanerpes erythrocephalus
				Red-cockaded Woodpecker/ Picoides borealis
		Trees > 20" dbh		Yellow-throated Warbler/ Dendroica dominica
				Blackburnian warbler/ Dendroica fusca
				Red-cockaded Woodpecker/ Picoides borealis
		Trees > 20" dbh	BIRD	Cerulean Warbler/ Dendroica caerulea
		Upland (usually mesic to dry, not subject to holding water)		Yellow-throated Warbler/ Dendroica dominica
				Ovenbird/ Seiurus aurocapillus
			REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Water (Distance Sensitive)		Southeastern Crowned Snake/ Tantilla coronata

Viability Assessment Report For Southern Yellow Pine Habitat Association

Prepared by
Timothy O. Reed
Daniel Boone National Forest

I. Description of Habitat Association

The Southern Yellow Pine Habitat Association can be found to a limited degree throughout the Daniel Boone National Forest (DBNF). However, most of this association is located on the southern half of the national forest, excluding the Red Bird district. Over 92 percent of this habitat association is located on the London, Somerset and Stearns districts (USDA Forest Service, 1998). This association can be found in several land type associations (LTA) across the forest but the majority of occurrences are in the Southern Cliff (221Hc003), Rockcastle Hills (221Hc005), London-Corbin Plain (221Hc006) and Big South Fork Plateau (221Hc009) LTA (USDA Forest Service, 1997).

On the DBNF this habitat association occurs primarily on ridge tops and the upper half of slopes. However, depending on the dominant pines species and the site conditions, it may occur on lower portions of slopes and in drainages. Soils are variable but the ridgetop sites typically range from 5 to 40 inches in depth. Slopes typically have depths over 40 inches but sandstone outcrops and cliffines are common. Some typical soil series include Rigley, Gilpin and Sequoia on the Ridges and Shelocta and Sequoia on the slopes. Most sites are moderately well drained (USDA Forest Service, 1997).

This association is dominated by an overstory of yellow pine species. On the DBNF these pine species most commonly include shortleaf, Virginia or pitch pine. These species also tend to occur on drier sites and are included in more xeric associations as mixed forest types. This association has an overstory yellow pine component that typically is at least 70 percent of the total overstory with the remainder composed of various hardwoods or other conifers. Other species that are typically found in the overstory of the Southern Yellow Pine Habitat Association include: scarlet oak, southern red oak, chestnut oak, white oak, black oak, blackgum, mockernut and pignut hickory, and red maple (Burns, 1990). Eastern hemlock and white pine may also occur as associates in some sites. Common understory associates include: dogwood, sourwood, sassafras, and red maple. *Vaccinium* species, *Gaylussacia* species and *Smilax* species are typical representatives of the herbaceous layer. Grasses such as bluestems, needlegrass, and broomsedge may occur in more open stands. Healthy stand structure in mature stands is ideally fairly open with overstory basal area (BA) of 60 to 80 square feet. This structure would benefit species that require large, mature trees and open midstory conditions. On the DBNF most of the mature representation of this association had a higher BA that usually falls in the 80 - 120 range (USDA Forest Service, 1998).

Disturbance has historically played a major role in creating and maintaining this association on the DBNF. Because this association is considered a sub-climax system, the amount of, and type of, disturbance is important to sustain the association. Past land uses in this association have included many types of disturbance activities such as logging for timber production, clearing for agriculture use, clearing for iron and charcoal production and clearing for settlement. However, fire is probably the single most important disturbance element in this association. Several researchers assert that fires have been essential to the development and perpetuation of pine forests in the southern Appalachians (Martin, 1991). On the DBNF, this association has been managed to some degree with prescribed fire over the last 15 – 20 years with increased acreage being managed in the last 5 years.

II. Current Status of the Habitat Association on the Daniel Boone National Forest

The DBNF has approximately 58,811 acres of forest area that is considered in the Southern Yellow Pine Habitat Association (USDA Forest Service, 1998). This represents over 8 percent of the total forested acres on the DBNF. Approximately 32 percent (18,655 acres) of this is greater than 70 years old. The age class less than 30 years old comprises approximately 40 percent (23,455 acres) of this association. On the DBNF this habitat association has historically been dominated by shortleaf and Virginia pine. Pitch pine stands only comprise about 2 percent (1,412 acres) of the total acreage for this association. However, pitch pine may be a component in stands labeled as either shortleaf or Virginia pine, but in acreage too small to be labeled as individual stands.

Much of this habitat contains high overstory BA and lacks grasses in the understory. In recent years this association was targeted for management by prescribed fire and hardwood midstory control for habitat improvements designed to benefit the endangered red-cockaded woodpecker (RCW). These activities occurred on the southern portions of the forest where existing RCW cluster sites or historical clusters occurred on the London, Somerset and Stearns districts.

Late in 1999 small infestations of Southern Pine Beetle (SPB) were documented on the Somerset and Stearns districts. By the summer of 2000 the SPB situation had turned critical and the forest experienced the worst outbreak of SPB that has ever been recorded in Kentucky. Efforts to control the epidemic were implemented by the forest but were largely ineffective. The problem continued into 2001 and currently continues to affect the remaining pines on the forest and throughout the state. Estimates as to the losses range from 75 to 90 percent for the total pine ecosystem with as much as 90 percent of the mature stands impacted by this epidemic. The devastation has been the most extensive in the southern portions of the forest where the greatest continuity of yellow pine habitat occurs.

This Southern Yellow Pine Habitat Association is currently in a state of devastation due to the SPB damage. Most of the pine overstory is either dead or infested. The SPB attack has destroyed yellow pine regeneration areas as young as 14 years old. Most of the pine regeneration younger than 12 to 14 years has survived. What currently remains is young regeneration and scattered pockets of mature and mid-aged habitat that are typically less than five acres in size.

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The desired future condition for this habitat association would be to provide amounts of suitable habitat in the proper stages of succession to ensure that the species dependant on the association have a high probability of persistence on the forest. This would involve maintaining a structured age class distribution with emphasis on maintaining a significant component of mature habitat that contains the habitat modifiers required by various species. This habitat is disturbance dependant and fire would likely be the primary tool to maintain this association.

Because this habitat has been decimated by the recent SPB epidemic the outlook for short-term viability of the habitat association itself is bleak. The SPB impacted mature and mid-aged yellow pine forest to a greater degree than early successional habitat. Therefore species dependant on more mature age classes may be impacted more so than species that utilizes the early successional habitats. Exact figures on the damage are not currently available. Based on the available information it is evident that the majority of the habitat greater than 15 years old has been severely impacted.

The majority of the species that depend on this habitat association may also occur in other habitat associations as well. While this habitat association may be preferred by the species, they can, and do, exist in other habitats that provide the required, but not optimal, conditions. However, other habitats alone may not be able to support the population at the levels that occurred in this association. Three species on the list are considered to be at greatest risk of losing viability on the forest. The RCW, pine warbler and pitch pine are all species considered to be extremely dependent on this association. The ability of these species to persist on the forest, even at lower levels, is in question.

I state with great certainty that the federally endangered RCW has lost the ability to persist on this forest due to SPB impacts in the pine habitat. Recent efforts to rescue the RCW from this situation have been largely successful in moving the remaining birds to suitable habitat in other states. Rescue efforts have given 15 individuals the chance for survival in other locations. This species no longer occurs on the DBNF. The pine warbler may be expected to persist on the forest in the short-term, but will likely occur in much lower numbers due to the pine habitat loss. Small, scattered pockets of mature and mid-aged pine habitat is likely to survive and the pine warbler may utilized this limited habitat to some degree. The extent to which pine warblers will utilize less optimal habitat, such as mixed associations, may determine the long-term persistence of this species on the DBNF. Pitch pine, as with the other yellow pine species, has been heavily impacted by the SPB and as stated earlier, occurred in limited quantities prior to the SPB attack. It is likely that pitch pine has been effectively removed as a dominant species in most of its former habitat. While the SPB has decimated this species the abundance of pitch pine has also declined over the years due to the lack of a cyclic disturbance regime, particularly the presences of fire.

The following recommendations take into consideration the need for restoration of this association for long-term viability. Recommendations for sustaining short-term viability, if

possible, will also be made. Because the SPB threat is still ongoing, there is uncertainty as to the final outcome of the epidemic. However, it is expected that 10 – 20 percent of the habitat will survive. For the purpose of planning, short-term will be considered the next 10 -15 years. Short-term items should be implemented as soon as possible to preserve and manage as much of the habitat as possible. Long-term viability recommendations will consider what is needed to ensure that the habitat and associated species continue to persist on the forest in perpetuity. Long-term items must be considered to fully restore the association to levels that support the affiliated species and to ensure a healthy, sustained habitat association. Long-term items should be implemented as soon as possible but the objectives will likely not be fully achieved in the next 10 – 15 year planning period.

Short-term recommendations

- Maintain all existing occurrences of the Southern Yellow Pine Habitat Association.
 - *Rational: Because of the recent decimation of this habitat, all of the areas that survive the SPB epidemic are considered vital if the associated species are to maintain a level of persistence. Areas of mature and mid-aged forest are of critical importance. Stands younger than 30 years old are also of extreme importance as this represents the areas that will provide mature habitat in the shortest amount of time.*
- Mature, mid-age and young stands of yellow pine that are susceptible to SPB infestation should be thinned to reduce this risk.
 - *Rational: The key is to maintain high radial growth and vigor in immature stands to reduce susceptibility to SPB infestation. High-risk stands are characterized by slow radial growth (Thatcher). Thinning to maintain desirable BA is considered a good method to reduce stand susceptibility to SPB attack. The thinning schedule must be prescribed on a site-specific basis using the best available silviculture to ensure good vigor and growth. Generally, overstocked stands greater than 70 yrs. old should be thinned to a total pine BA of 60 – 80. Younger stands (10 – 30 yrs old) and mid –age stands (31 – 69 yrs. old) should be thinned to a BA of 70 – 90.*
- Use prescribed fire in pine areas and SPB damaged areas to maintain understory conditions in surviving stands and control hardwood regeneration in SPB killed pine areas.
 - *Rational: Prescribed fire use is critical to maintain site conditions in pine-dominated areas that have been decimated by SPB. The periodic use of fire will maintain suitable understory conditions to a limited degree and set back hardwood succession until further restoration efforts can be implemented. It is also important to continue to treat any surviving pine areas with the use of prescribed fire. This will help maintain favorable conditions in the limited amount of remaining habitat. This will afford species linked to this association the best chance for some level of persistence on the forest.*

- Establish a management area that has emphasis on yellow pine management and restoration.
 - *Rational: The HMA currently in the forest plan (USDA Forest Service, 1985) will not be necessary to sustain the RCW or other species in this association. The HMA is species-specific to recovery objectives for the RCW, which no longer exists on the DBNF. In order to sustain and recover this habitat association a management area with special emphasis on yellow pine restoration and the use of prescribed fire may be needed. This will allow planning for the recovery of this habitat association to be focused in suitable sites and ensure the continuity and juxtaposition is provided for species requiring interior conditions.*

Long-term recommendations

- Restore southern yellow pine habitat association impacted by SPB in areas with suitable site conditions.
 - *Rational: Restoration of habitat should be the primary goal for the management of this association. In order to provide habitat for the associated species at reasonable levels, long-term objectives must emphasize this ecosystem in areas with proper site conditions. Areas of sufficient size that provide the necessary habitat components for the species group will be priority. Site conditions such as soil type, aspect, moisture regime, site index, ability to prescribe burn and Landtype association should all play a role in the selection of which areas to concentrate restoration efforts in.*
- Plan restoration efforts to provide for continuity of the habitat for species dependant on large tracts and forest interior.
 - *Rational: Large blocks of this habitat should be restored based on the landscape position of the suitable sites. Symmetrical blocks are typically not possible due to the position this association typically occupies on the landscape. Continuity of habitat can be provided in a linear fashion along ridgetops and connecting ridgelines. Gaps in this habitat are to be expected due to varying site conditions and changes in elevation and aspect that favor other habitat associations (e.g. drainages between ridgelines or north slopes). Gaps, and the size of the gaps, should be dictated by the natural breaks in site conditions and not by artificial management boundaries.*
- Restore 10 - 12 percent of the total forest area to the southern yellow pine habitat association.
 - *Rational: Previous to the SPB epidemic approximately 8 – 9 percent of the forest area was considered within this association. The proposed increase in total area will likely be a result of restoration efforts in the mixed pine-hardwood associations and conversion of some upland sites currently dominated by hardwoods. The use of prescribed fire at the landscape level will favor the development of pine habitat in upland sites currently dominated by fire intolerant species due to years of fire*

suppression. These sites will add to the continuity of the association and provide for species requiring larger tracts of habitat.

- Structure restoration activities to ensure distribution of various age classes that provide for habitat modifiers.
 - *Rational: Restoration activities should allow for distribution of age classes to avoid excessive amounts of young and mid age forest. The standard rotation age for this association should be 120 yrs. for shortleaf and pitch pine. Due to the characteristics of Virginia pine it should be considered for regeneration at 90 yrs. (USDA 1985). These rotation ages will not come into play until it is determined necessary to ensure stand health or to supply the early successional stage in this association. The intentional regeneration of mature stands in this association would not be expected to be necessary within the next 50 yrs. due to restoration of decimated areas. These restoration areas will supply the early stages of succession and move into the mid-age classes in the future. However, regeneration of some stands prior to rotation age may be necessary to balance age classes at some point. A desired future condition for age class distribution should provide approximately 1/3 of the acres in older age classes and the remaining acres in distribution to supply a constant flow into the older age groups. A possible example of this flow is as follows:*

Age Groups	1998	Desired Management
0-10	4.7 percent	6-10 percent
11-30	34.7 percent	20-25 percent
31-80	38.1 percent	34-38 percent
80+	22.6 percent	30-35 percent

The 0 - 10 age group provides the shrubby conditions required by species utilizing the early successional habitats. The 11 - 30 age group provides for species requiring high stem density and developing structure (sapling/pole) in the overstory. The 31 – 80 age group develops well-defined structure for species utilizing the mid-age forest and begins to provide modifiers such as cavities and downed logs. The majority of the species in this association are linked to older age classes. The older age classes provide modifiers such as large trees, open midstory, grassy understory and open areas resulting from downed trees. These modifiers are dependant on proper maintenance of the area as age class progresses. To achieve the older age classes perpetually, the early stages are necessary regardless of their direct benefit to species linked to this association.

- Focus restoration activities on pitch pine in suitable areas.
 - *Rational: Pitch pine should be considered as priority for restoration in areas where the site conditions allow. This species is limited in distribution and is considered a fire dependant species. This species should only be managed for in areas where the use of fire is practical on a regular, long-term basis.*

- Use the most appropriate silviculture methods to re-establish yellow pine habitat during restoration activities.
 - *Rational: Preparation of damaged sites for reforestation may include prescribed burning, mechanical treatment, and salvage harvest. Any method of timber stand improvement (TSI) may be used to ensure the best possible radial growth and vigor is maintained. TSI activities may include mechanical or herbicide treatment to reduce competition from undesirable species.*
- Retain some large downed logs in areas targeted for restoration.
 - *Rational: Reptiles linked to the Southern Yellow Pine Habitat Association utilize large downed logs. Restoration activities have the potential to remove much of the residual debris and care should be taken to ensure this species requirement is met during these activities.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

Monitoring and Inventory of the Southern Yellow Pine Habitat Association will need to be implemented at a level sufficient to provide data to track the current condition of the habitat. This would allow management decisions as to the level of restoration needed to achieve the desired amount and condition of this habitat association. All monitoring and inventory recommended for the General Forest Habitat Association apply to this association. Within this association it may be necessary to monitor some species that are directly related to this habitat. This species specific monitoring will further support the analysis of the sustainability of the association. The following items are considered necessary to ensure that the association can be properly evaluated and decisions supported.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 – 15 years. (High priority)
 - *Rational: Inventory to identify and update baseline data or assess changed conditions after non-prescribed major disturbances. Inventory may be at the stand level or larger units may be used (such as ecological or habitat units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*
- Employ GIS and vegetation management databases to track the condition and composition of the yellow pine habitat association. (High priority)
 - *Rational: The use of FSVeg (or CISC currently) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the pine habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers and the data is entered in a timely fashion.*

- Annual monitoring reports should include an analysis of the southern yellow pine habitat association using the latest inventory data. (High priority)
 - *Rational: This annual check of the conditions of the habitat association will help ensure that any potential management problems regarding the composition, age class structure or habitat modifiers of the association are readily identified. This info should be displayed using the most up to date GIS coverage.*
- Monitor prescribed fire use to determine changes effected in this association. (High priority)
 - *Rational: Information concerning pre-burn and post-burn condition should be monitored as part of the requirements for the use of prescribed fire. This may be accomplished by any logical method such as photo points or vegetation plot sampling. The objective is to monitor both short-term and long-term changes in the site conditions resulting primarily from the disturbance of prescribed fire.*
- Inventory stands currently identified as containing pitch pine and monitoring the condition of these stands. (Medium priority)
 - *Rational: Pitch pine forest types are limited on this forest and should be of high concern for persistence. Pitch pine stands should be monitored to track the persistence of this species on the DBNF. Current CISC data will need to be updated to reflect the current condition of the pitch pine stands.*
- Continue to implement R8 landbird monitoring program. (Medium priority)
 - *Rational: This monitoring program will help track the persistence of pine warbler and other species dependant on the yellow pine habitat association. This may be a critical element in documenting the changes in species composition that are expected to occur as a result of SPB damage. Because this monitoring program contains points linked to this association it would be considered an excellent tool for both species-specific and association monitoring.*

References:

- Burns, Russell M., and Barbara H. Honkala, tech. Cords. 1990. Silvics of North America: Vol. 1. Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service. Washington, DC.
- Martin, W.H. 1991. The Role and History of Fire in the Daniel Boone National Forest. Division of Natural Areas, Eastern Kentucky University. Richmond KY. 131 p.
- Thatcher, R.C., J.L. Searcy, J.E. Coster, and G.D. Hertel. ????. The Southern Pine Beetle. Technical Bulletin 1631. USDA Forest Service, Expanded Southern Pine Beetle Research and Applications Program, Atlanta, GA.

07/15/2003

USDA Forest Service, 1985. Land and Resource Management Plan Daniel Boone National Forest. USDA Forest Service, Southern Region, Winchester, KY.

USDA Forest Service. 1997. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

USDA Forest Service. 1998. Continuous inventory of stand condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

Attachment A.

Species List: Southern Yellow Pine Habitat Association

Class	Common Name/Species
ANIMALS	
Birds	Sharp-shinned Hawk/ <i>Accipiter striatus</i> Bachman's Sparrow/ <i>Aimophila aestivalis</i> Chuck-will's Widow/ <i>Caprimulgus carolinensis</i> Prairie Warbler/ <i>Dendroica discolor</i> Yellow-throated Warbler/ <i>Dendroica dominica</i> Blackburnian Warbler/ <i>Dendroica fusca</i> Pine Warbler/ <i>Dendroica pinus</i> Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i> Red-cockaded Woodpecker/ <i>Picoides borealis</i> Summer Tanager/ <i>Piranga rubra</i> Red-breasted Nuthatch/ <i>Sitta canadensis</i>
Reptiles	Southern Five-lined Skink/ <i>Eumeces inexpectatus</i> Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i> Northern Pine Snake/ <i>Pituophis melanoleucus melanoleucus</i> Southeastern Crowned Snake/ <i>Tantilla coronata</i>
LICHENS	Reindeer Lichen/ <i>Cladina</i> spp. (cf. <i>rangiferina</i> , <i>subtenuis</i>)
PLANTS	
Dicots	Monkshood/ <i>Aconitum uncinatum</i> (generic) Eastern Silvery Aster/ <i>Aster concolor</i> Box Huckleberry/ <i>Gaylussacia brachycera</i> St. Peter's-wort/ <i>Hypericum crux-andreae</i> Cross-leaf Milkwort/ <i>Polygala cruciata</i> var. <i>cruciata</i> Racemed Milkwort/ <i>Polygala polygama</i> var. <i>polygama</i> Hairy Snout Bean/ <i>Rhynchosia tomentosa</i> Slender Marsh-pink/ <i>Sabatia campanulata</i> American Chaffseed/ <i>Schwalbea americana</i> Spiked Hoary-pea/ <i>Tephrosia spicata</i>
Gymnosperms	Pitch Pine/ <i>Pinus rigida</i>
Liverworts	Liverwort/ <i>Nowellia curvifolia</i>
Monocots	Grass-pink/ <i>Calopogon tuberosus</i> Appalachian Spreading Pogonia/ <i>Cleistis bifaria</i> Pink Lady-slipper/ <i>Cypripedium acaule</i> Bearded Skeleton Grass/ <i>Gymnopogon ambiguus</i>

07/15/2003

Class

Common Name/Species

Yellow-crested Orchid/ *Platanthera cristata*

Globe Beaked-rush/ *Rhynchospora globularis* var. *globularis*

Fringed Nut-rush/ *Scleria ciliata* var. *ciliata*

Yellow-eyed Grass/ *Xyris caroliniana*

Yellow-eyed Grass/ *Xyris torta*

Attachment B.

Southern Yellow Pine Species/Habitat Relationships with References

ANIMALS

Birds

Sharp-shinned Hawk – *Accipiter striatus* – Throughout the year, sharp-shinned hawks utilize pine species. Although they are known to nest in hardwoods, birds in Kentucky seem to prefer evergreens for nesting and over-wintering. A large, mature pine is a typical nesting site, provided it is within an extensive tract of forest and therefore, they would be attracted to southern yellow pine forests for nesting. Planting of pine in various areas in the state has increased nesting sites for the species, as seen in central and western regions where pine habitat had been lacking (Palmer-Ball 1996). Although sharp-shinned hawks are observed (particularly when foraging) in areas having a mix of forested and semi-open habitat, they more frequently occur in forested tracts and are considered forest interior birds.

Bachman's Sparrow – *Aimophila aestivalis* – This species typically requires dense grassy places where scattered trees or saplings are present, usually in pine forests (Hamel, 1992). Historically found in mature to old growth southern pine woodlands subject to frequent growing-season fires (NatureServe, 2001). This provided the grassy undergrowth require by this species. This species formerly inhabited a variety of early successional habitats in KY (Palmer-Ball, 1996). The Bachman's sparrow would be attracted to the southern yellow pine forests where those forests have been frequently burned and have a grassy understory.

Chuck-will's Widow – *Caprimulgus carolinensis* – This species tends to favor mixed oak and pine stands (DeGraaf et. al., 1991). It may occur and breed in general woods and forests that are primarily dry or mesic (Hamel, 1992). It appears to be much more common in drier forest where the understory and midstory levels are relatively open (Palmer-Ball, 1996). It typically feeds over adjacent fields and clearings (Hamel, 1992). The dry conditions and open understory most commonly associated with a healthy southern yellow pine forest would be preferred by this species.

Prairie Warbler – *Dendroica discolor* – Prairie warblers occur in semi-open, early successional, and woodland habitats. Mixed forest types—especially those that have been cut-over or burned--with pines and cedars are occupied. Forest edges, clearings, brushy borders, and overgrown fields with scattered saplings or small trees are commonly used. On the DBNF, the birds are nearly always found in early successional habitat, especially young clearcuts and the undergrowth of shelterwood cuts, and often at wood edges and in stands that have been burned (L. Perry, pers. obs.).

Yellow-throated Warbler – *Dendroica dominica* – In some areas, hardwood-pine is used; however, birds on the Cumberland Plateau show a preference for pine (Mengel 1965) and a southern yellow pine forest would offer good habitat for this species. Sites may range from moderately moist to dry/upland, provided the stands are rather open and have large trees (> 20" dbh). On the DBNF, the birds are frequently observed in mature pine trees, and almost always

observed in or near pines; they are frequently seen in stands with open canopies (L. Perry, pers. obs.).

Blackburnian Warbler – *Dendroica fusca* – The blackburnian warbler has a slight preference for forests of hardwoods mixed with hemlocks, spruce and fir (Hamel 1992). On the DBNF, this species has only been encountered during periods of migration and would not be expected to breed on the DBNF except in areas where elevations are greater than 3500', of which there are few of. This is a forest interior species of higher elevations, with most of the birds that are recorded in the Cumberland and Southern Appalachians occurring above 3500 feet (Hamel, 1992). A variety of coniferous and mixed forest types are utilized, with deciduous habitat being used to a greater extent in this southern part of the breeding range (DeGraaf et. al., 1991). Extensive tracts of mature forest, with large (> 20" dbh) nesting trees, are required (Hamel, 1992). The blackburnian warbler may be attracted to the evergreen component of southern yellow pine stands during migration.

Pine Warbler – *Dendroica pinus* – Pine warbler habitat consists of open to fairly dense stands of yellow pine and pine-hardwood. Although most numerous in extensive pine stands, the birds will use small stands of pine, as well (Mengel 1965). Suppression of fire has contributed to reduction of pine in some areas (Palmer-Ball, 1996). Both middle-aged and mature stands are used; however, nesting is usually in mature pines.

Red-headed Woodpecker – *Melanerpes erythrocephalus* – Semi-open to open habitat with an abundance of large (> 14" dbh), dead trees is preferred for both breeding and wintering purposes. Relatively open, mature woods, swamps, clearings within mixed woodland, forest edges, and places where groves of trees are present, such as park-like settings, are commonly used. On the DBNF, the birds are often observed in pine-dominated stands that have been frequently burned (L. Perry, pers. obs.). Nesting is in dead trees, or in dead limbs of live trees (Mengel 1965). This species generally avoids mature closed canopy forest during the breeding season (Palmer-Ball, 1996).

Red-cockaded Woodpecker – *Picoides borealis* – Habitat for this species is generally thought of as being primarily open pine woods. Habitat is generally fairly forest with little or no midstory. The birds prefer conditions of minimal understory (Hamel, 1992). It is likely that the red-cockaded woodpecker used forests that were maintained by natural fires (Palmer-Ball, 1996). On the DBNF this species seems to be attracted to open, frequently burned pine dominated stands where it selects live mature pine trees for nesting (L. Perry, pers. observation). These stands contain cavity trees that typically range in age from 90 to 128 years old and have an average diameter at breast height of 14.2-18.9 inches (Murphy, 1980). Due to southern pine beetle impacts to the primary habitat of this species, all known individuals on the DBNF have been relocated out of state to suitable habitat in other populations.

Summer Tanager – *Piranga rubra* – Relatively dry sites, which tend to produce stands of a semi-open condition, are frequented by this species. Uplands are commonly used, but the birds may occur in a variety of habitats, including bottomlands and wooded residential areas. Forest types range from hardwood to pine-hardwood stands of open to medium density. On the DBNF, the birds are frequently found in mature, mixed pine stands that have been burned and undergone

midstory removal (L. Perry, pers. obs.). Oaks are often chosen for nesting, in open woodland or forest edge and often over open spaces such as roads and clearings (Mengel 1965). The summer tanager would be particularly attracted to the open, dry conditions generally found in healthy southern yellow pine stands.

Red-breasted Nuthatch – *Sitta Canadensis* – Though this nuthatch is dependent on coniferous habitat, its requirements vary considerably between seasons. It generally breeds at elevations above 3500 feet, in dead spruce or fir trees. Occasionally it will nest in hemlock and, rarely, in pine. Suitable snags (dead trees) are greater than 6" dbh (six inch diameter at breast height). Mature stands are favored. The red-breasted nuthatch prefers to overwinter in dense stands of conifers and pine-oak and frequents the southern yellow pine forest during the winter. During that time, the birds are not particular to age class so much as to stand density. On the DBNF, when these birds are encountered in winter, it is almost always while feeding in pines—especially mature Virginia pines having a lot of cones (L. Perry, pers. obs.).

REPTILES

Southern Five-lined Skink – *Eumeces inexpectatus* – The southern five-lined skink ranges from Virginia south to the Florida keys, and westward to the Mississippi River. This skink is most abundant in dry habitats, such as pine clearings, beaches, ridge tops and well-drained, sandy places. This species has been documented around man-made structures, field and wood edges, urban woodlots, dry pine forests, mixed pine-hardwood forests, early stages of lowland pine communities and sawdust piles. (Virginia website.) This skink is considered terrestrial and arboreal. The southeastern five-lined skink diet consists of a variety of arthropods. (Wilson, 1995)

Eastern Slender Glass Lizard – *Ophisaurus attenuatus longicaudus* – This is a species of dry, often sandy, soil conditions. It occurs in relatively open, typically upland, habitats--including Virginia and Shortleaf Pine and pine-oak stands, forest edges, grassy fields and prairies--which have loose, friable soils. This secretive, legless lizard tends to stay in old rodent burrows and under mats of dead grass and decomposing plants; when it basks in the sun, it is often hidden in tall grass or with only part of its body showing (VA Dept. of Game and Inland Fisheries 2001). Slender Glass Lizard diets include insects, spiders, birds' eggs, smaller lizards, and snakes. Prescribed burning and other management practices that help to create open canopy conditions benefit this lizard species.

Northern Pine Snake – *Pituophis melanoleucus melanoleucus* – Pine Snakes inhabit dry, sandy pine and pine-oak forest types with open canopies and patchy to dense ground cover. Eastern KY sites are typically upland or ridgetop; whereas, at lower elevations the snakes utilize pine flatwoods and sandhill areas. Forest openings with scattered areas of well-drained sand and little shrub cover are required for nesting and hibernation sites (NatureServe 2001). These secretive snakes spend much of their time in burrows, emerging to hunt for small mammals, birds and eggs; they climb trees well. Loose or friable soil is needed, since the snakes excavate their own burrows as well as use those made by small mammals. This species requires a relatively large area in which to forage (Wilson 1995). Management practices, including midstory control and prescribed burning, which serve to promote and maintain barrens-like conditions—open stands with well-lit, grassy understories—are necessary to support the species.

Southeastern Crowned Snake – *Tantilla coronata* – The southeastern crowned snake ranges from south-central Virginia and southern Illinois to the Florida panhandle and eastern Louisiana. This secretive snake is an excellent burrower, spending much of its time concealed in rotting logs, under bark, stones, leaf litter, pine needles, or burrowed in the soil. The southeastern crowned snake apparently prefers relatively xeric, well-drained soils in pine flatwoods, sandhills and dry hillsides. This snake requires dry habitats with friable soil and sufficient debris for shelter. Females deposit eggs in rotting logs or sawdust piles. The southeastern crowned snake's diet consists of centipedes, spiders, termites, and other small, soft-bodied arthropods. (Wilson, 1995).

PLANTS

Dicots

Monkshood – *Aconitum uncinatum* (generic) – on the DBNF belongs to the subspecies *uncinatum*. Species-habitat relationships are discussed for this subspecies in other habitat associations.

Eastern Silvery Aster – *Aster concolor* – is a coastal plain species where it is found in pine savannas. On the DBNF, it is found in open yellow pine or yellow pine-oak forest that has a sparse midstory and a grass-forb ground layer. It is also found in and at the edge of warm season grassland areas, including powerline rights-of-way. It requires high light conditions and benefits from the application of fire to its habitat.

Box Huckleberry – *Gaylussaccia brachycera* – is a central Appalachian species. It occurs in upland yellow pine and yellow pine-oak woods. Yellow pine is present in or adjacent to all sites on the DBNF. It is also found on sandstone glades and in the upland portions of utility rights-of-way. The species appears to require well-drained, sandy soils. *Gaylussaccia* will grow in closed canopy (yellow pine) conditions if the midstory and shrub layers are more or less absent. On the DBNF, the densest, and apparently the healthiest populations, are found in these sites. It also grows under more open canopy conditions where it is tolerant of thicker midstory and shrub layers. The rhizomes are positioned at the transition between the duff and mineral soil. Fire maintains the general habitat in which it grows. The species is top killed by fire, but does resprout, at least if the duff layer is not removed. Recovery appears to be slower than for other

Gaylussacia species or *Vaccinium* species, but with the proper interval and intensity of fire, populations should be maintained while enhancing habitat.

St. Peter's-wort – *Hypericum crux-andreae* – is a coastal plain species with scattered populations in the interior. The species grows on usually damp sandy soil, in roadside ditches, and in open, wet yellow pine forest. On the DBNF, it occurs in open, wet warm season grassland. These sites were likely forested, but open prior to their current condition.

Cross-leaf Milkwort – *Polygala cruciata* var. *cruciata* – is coastal plain species with inland records along the Appalachian Plateaus and in midwestern prairie states. It is known from damp to wet meadows, yellow pine savannas, and bogs. On the DBNF, it is known from wet meadows and open, wet non-forested areas such as warm season grassland.

Racemed Milkwort – *Polygala polygama* var. *polygama* – has a midwestern and coastal plain distribution. It is usually found on dry, sandy soil in open forest or grassland. The DBNF sites are on sandy soil in open, ridge top, yellow pine-oak forest or sandy, grassy openings.

Hairy Snout Bean – *Rhynchosia tomentosa* (var. *tomentosa*) – is found throughout most of the southeastern US. It grows in dry, open, often sandy, oak or yellow pine forest, at forest margins, in sandhills, and occasionally in mesic forest. The DBNF sites are all in warm season grassland, or low disturbed vegetation along roads or under powerline rights-of-way.

Slender Marsh-pink – *Sabatia campanulata* – is coastal plain species found in salt or brackish marshes. It occurs inland in a few areas. The DBNF sites are from wet meadows.

American Chaffseed – *Schwalbea americana* – occurs in two general kinds of habitats, wet and dry. In all cases, soils are sandy and somewhat sterile. In wet habitats, the combination of constant water and periodic fire maintain the site in an open condition. The overstory is open as are the midstory and shrub layers beneath it. Generally wet sites are grassy with few shrubs. Periodic fire helps to maintain the open condition of the sites. It also plays a role in triggering flowering. This habitat type is not known from the DBNF. Dry habitats likewise are open with a thin overstory and open midstory and shrub layers. These sites are generally a mixture of forbs, grasses, and low shrubs. Some dry habitats are subjected to periodic burns, which help to maintain the open condition. Fire here also helps to trigger flowering. In other dry habitats, the openness is more edaphically controlled. The historic sites on the DBNF fall into this group. Here fire would have triggered flowering. Other dry DBNF sites could, with periodic fire, support *Schwalbea* populations.

Spiked Hoary-pea – *Tephrosia spicata* – is a southern species with a number of more northern stations. It is commonly found in dry to wet, open yellow pine or yellow pine-hardwood forest, roadsides, clearings and fields. On the DBNF, the species is found on boulder/cobble bars along larger streams and rivers of the Cumberland River drainage. A few sites are known from sandy, sparsely shaded openings on ridges.

Gymnosperms

Pitch Pine – *Pinus rigida* – ranges from New England to the Appalachian Mountains. It grows in generally sterile, sandy soil where it competes well against many other woody species. These

soils are usually dry, but may be moist. The cones are semi-serotinous, opening following hot fires or occasionally very hot days. Fire also prepares a seedbed advantageous to the light seeds. On the Daniel Boone NF, this species is most commonly found within a few hundred feet of sandstone cliffs. The soils here are sandy, thin and usually dry providing the conditions under which the species competes. These areas also would have been subject to periodic burning, aiding regeneration of the species.

Liverworts

Liverwort – *Nowellia curvifolia* – is widespread in northern North America, south into the Appalachian provinces, present in the high mountains of Mexico and Central America. It is found almost exclusively on decorticated logs. On the DBNF, it is found almost exclusively on decorticated eastern hemlock and yellow pine logs, usually of 10-12 inch diameter or larger. It requires moderate to heavy shade.

Monocots

Grass-pink – *Calopogon tuberosus* – is a coastal plain species found in wet to moist pine savannas, roadside ditches, pitcher plant bogs, and other open, wetland habitats. A few historic Kentucky stations occurred in dry, sandy soil on ridgetops under open oak or oak-yellow pine forest. On the DBNF, a few extant stations are known from streamhead wetlands, slope seeps or wet warm season grassland. It may have occurred on drier sites in the past. The species requires constant moisture and more or less open conditions.

Appalachian Spreading Pogonia – *Cleistes bifaria* – ranges from the Appalachian Plateaus to the Piedmont. It is found in a variety of sites ranging from glades to open forest to warm season grassland to streamhead wetlands. It occurs on well-drained substrates (on hummocks in wetlands) usually in open or partially open conditions. The plants can be single or occur in colonies. On the DBNF, it is known from glades, streamhead wetlands, seep slopes, and on road cuts in upland oak forest. Fire enhances flowering and total numbers of plants. Fire probably helps to maintain habitat as well.

Pink Lady's-slipper – *Cypripedium acaule* – across its range occurs in acid forests or wetlands (usually sphagnum bogs). On the DBNF, pink lady-slipper is found in upland oak and mixed pine-oak woods, and occasionally on hummocks within seeps and streamhead wetlands. It occurs in light to heavy shade, but does not seem to flower unless in somewhat open conditions. This species responds well to burning. It is not uncommon to find 3-4 dozen plants in flower and as many more in vegetation condition following a fire where only a dozen or so were found before. The species is experiencing collection pressure from root diggers. Digging of this species is not permitted on the DBNF.

Bearded Skeleton Grass – *Gymnopogon ambiguous* – is a coastal plain species that generally occurs in dry, sandy, open forest. It may also occur in open grassland. On the DBNF, it occurs in open warm season grassland and open, sandy ground with or without light forest cover.

Yellow-crested Orchid – *Platanthera cristata* – occurs in a wide variety of habitats across its range. On the DBNF, it occurs in streamhead wetlands, seeps, and in permanently damp to wet areas in warm season grassland. It occurs in low to moderate shade conditions. This species is an

alternative host to the endophyte fungus that is the sole fungal associate for white fringeless orchid (*P. integrilabia*). Maintaining this orchid helps to maintain a diverse stock for the fungal symbiont

Globe Beaked-rush – *Rhynchospora globularis* var. *globularis* – is a coastal plain species with stations in the interior. It commonly occurs on wet sand and in swamps and bogs, either in the open or under open canopy. The DBNF populations occur in wet open, usually sandy areas in warm season grassland or disturbed ground.

Fringed Nut-rush – *Scleria ciliata* var. *ciliata* – is a coastal plain species with stations inward to Missouri and Kentucky. It commonly is found in damp, sandy soil of open areas, grasslands, and open, yellow pine or yellow pine-oak forests. In the DBNF area, the sites for this species are all on boulder/cobble bars of rivers in the Cumberland River drainage (McCreary County). The bars are subject to flooding and scouring, which keeps sand on the site, and maintains open conditions.

Yellow-eyed Grass – *Xyris caroliniana* – is not found in the state. It is a misidentification which has been tracked erroneously. The specimens are referable to *X. torta* (Medley, 1993)

Yellow-eyed Grass – *Xyris torta* – is a coastal plain and lake state species found in bogs and wet, sandy soil of open yellow pine forest and grasslands. The DBNF records are from streamhead wetlands, slope seeps, and wet warm season grasslands and meadows.

LICHENS

Reindeer Lichens – *Cladina* spp (cf. *rangiferina*, *subtenuis*) – are widespread in North America, forming the primary ‘vegetation’ in some parts of the tundra. These symbiont organisms are usually found on harsh sites, often dry and sterile. On the DBNF, they are most common on the thin soils of sandstone or conglomerate glades. They may also occur on bare rock or on woody material on the glades. The sites are usually open with little canopy. These lichens do not seem to grow under shrubs or dense tree growth. They are sometimes found on soils that were exposed to high heat during fire events.

References:

- Barbour R.W. 1971. Amphibians and reptiles of Kentucky. The University Press of Kentucky. Lexington, KY.
- Behler, J.L. and F.W. King. 1979. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York.
- Conant, R. and J.T. Collins. 1991. Peterson field guide to reptiles and amphibians: eastern and central North America. 3rd ed. Houghton Mifflin. Boston, MA.
- DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and Rangeland Birds of the United States: natural history and habitat use. U.S. Department of Agriculture Handbook 688. 625 pp.

- Hamel, Paul B. 1992. Land manager's guide to birds of the South. The Nature Conservancy, Southeastern Region. Chapel Hill, NC. 437 pp.
- Mengel, R.M. 1965. The birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union. The Allen Press. Lawrence, KS. 581 pp.
- Murphy, G.A. 1980. Status, nesting habitat, foraging ecology, and home range of the Red-cockaded Woodpecker (*Picoides borealis*) in Kentucky. Unpublished Masters thesis. Eastern Kentucky University. Richmond, KY.
- NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Association for Biodiversity Information, Arlington, VA. Available: <http://www.natureserve.org/>. Accessed: July 25, 2001.
- Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky. Lexington, KY. 372 pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.
- Storm Damage DEIS
- VA Department of Game and Inland Fisheries: VA Fish and Wildlife Information Service. 2001. Available: <http://www.dgif.state.va.us/>. Accessed July 26, 2001.
- Wilson, L.A. 1995. Land manager's guide to the amphibians and reptiles of the South. The Nature Conservancy, Southeastern Region. Chapel Hill, NC; and the U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA.

07/15/2003

Attachment C.

Southern Yellow Pine Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
9-S. Yel. Pine	Southern Yellow Pine Forest	(blank)	BIRD	Chuck-will's widow/ <i>Caprimulgus carolinensis</i>
				Red-breasted Nuthatch/ <i>Sitta canadensis</i>
				Red-cockaded Woodpecker/ <i>Picoides borealis</i>
			P-DIC	Hairy Snout Bean/ <i>Rhynchosia tomentosa</i>
			P-MON	Globe Beaked-rush/ <i>Rhynchospora globularis</i> var. <i>globularis</i>
		Acidic Substrate	P-DIC	Racemed Milkwort/ <i>Polygala polygama</i> var. <i>polygama</i>
		Aspect (SE to NW)	P-GYM	Pitch Pine/ <i>Pinus rigida</i>
		Burrows, Holes, Tunnels (Secondary Users)	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
				Northern Pine Snake/ <i>Pituophis melanoleucus melanoleucus</i>
		Downed Logs		Southeastern Crowned Snake/ <i>Tantilla coronata</i>
				Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
		Downed Logs (minimum size)	P-LIV	Liverwort/ <i>Nowellia curvifolia</i>
		Drainage Good	REPT	Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
		Dry	BIRD	Chuck-will's widow/ <i>Caprimulgus carolinensis</i>
				Summer tanager/ <i>Piranga rubra</i>
			P-DIC	Eastern Silvery Aster/ <i>Aster concolor</i>
				Spiked Hoary-pea/ <i>Tephrosia spicata</i>
			P-MON	Bearded Skeleton Grass/ <i>Gymnopogon ambiguus</i>
				Pink Lady-slipper/ <i>Cypripedium acaule</i>
			REPT	Southeastern Crowned Snake/ <i>Tantilla coronata</i>
		Elevation (above 2300 ft)	BIRD	Blackburnian warbler/ <i>Dendroica fusca</i>
				Red-breasted Nuthatch/ <i>Sitta canadensis</i>
		Fire Dependent		Red-cockaded Woodpecker/ <i>Picoides borealis</i>
		Fire Tolerant/Enhanced		Bachman's Sparrow/ <i>Aimophila aestivalis</i>
				Pine warbler/ <i>Dendroica pinus</i>
				Red-cockaded Woodpecker/ <i>Picoides borealis</i>
				Red-headed woodpecker/ <i>Melanerpes erythrocephalus</i>
		Forb/Grass Condition		Bachman's Sparrow/ <i>Aimophila aestivalis</i>
			P-DIC	Racemed Milkwort/ <i>Polygala polygama</i> var. <i>polygama</i>
		Forest Interior (Minimal Edge)	BIRD	Blackburnian warbler/ <i>Dendroica fusca</i>
				Cerulean Warbler/ <i>Dendroica caerulea</i>
				Sharp-shinned Hawk/ <i>Accipiter striatus</i>
				Yellow-throated Warbler/ <i>Dendroica dominica</i>
		Large Decadent Trees		Red-cockaded Woodpecker/ <i>Picoides borealis</i>
				Sharp-shinned Hawk/ <i>Accipiter striatus</i>
				Yellow-throated Warbler/ <i>Dendroica dominica</i>
		Leaf Litter	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Southern Five-lined Skink/ Eumeces inexpectatus
		Mature forest	BIRD	Blackburnian warbler/ Dendroica fusca
				Cerulean Warbler/ Dendroica caerulea
				Pine warbler/ Dendroica pinus
				Red-breasted Nuthatch/ Sitta canadensis
				Red-cockaded Woodpecker/ Picoides borealis
				Sharp-shinned Hawk/ Accipter striatus
				Yellow-throated Warbler/ Dendroica dominica
		Mid-age Forest		Pine warbler/ Dendroica pinus
		Moist	P-DIC	Slender Marsh-pink/ Sabatia campanulata
			P-MON	Fringed Nut-rush/ Scleria ciliata var. ciliata
				Grass-pink/ Calopogon tuberosus
				Yellow-crested Orchid/ Platanthera cristata
				Yellow-eyed Grass/ Xyris caroliniana
		Old Growth Condition	BIRD	Red-cockaded Woodpecker/ Picoides borealis
		Open (Little or No Shade)		Summer tanager/ Piranga rubra
			P-LICH	Reindeer Lichen/ Cladina spp (cf. rangiferina, stellaris, subtenuis)
		Open Forest Canopy	BIRD	Pine warbler/ Dendroica pinus
				Summer tanager/ Piranga rubra
				Yellow-throated Warbler/ Dendroica dominica
			P-DIC	Cross-leaf Milkwort/ Polygala cruciata var. cruciata
				St. Peter's-wort/ Hypericum crux-andreae
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
				Globe Beaked-rush/ Rhynchospora globularis var. globularis
				Grass-pink/ Calopogon tuberosus
		Open Midstory/Understory	BIRD	Bachman's Sparrow/ Aimophila aestivalis
				Cerulean Warbler/ Dendroica caerulea
				Chuck-will's widow/ Caprimulgus carolinensis
				Red-cockaded Woodpecker/ Picoides borealis
			P-DIC	Box Huckleberry/ Gaylussacia brachycera
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
			REPT	Northern Pine Snake/ Pituophis melanoleucus melanoleucus
		Riparian		Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Rocky/Rocks	P-GYM	Pitch Pine/ Pinus rigida
			REPT	Northern Pine Snake/ Pituophis melanoleucus melanoleucus
				Southeastern Crowned Snake/ Tantilla coronata
				Southern Five-lined Skink/ Eumeces inexpectatus
		Sandy Soil	P-DIC	American Chaffseed/ Schwalbea americana
				Eastern Silvery Aster/ Aster concolor
				Monkshood/ Aconitum uncinatum (generic)
				Slender Marsh-pink/ Sabatia campanulata
			P-GYM	Pitch Pine/ Pinus rigida
			P-LICH	Reindeer Lichen/ Cladina spp (cf. rangiferina, stellaris, subtenuis)
			P-MON	Fringed Nut-rush/ Scleria ciliata var. ciliata

07/15/2003

<u>Association</u>	<u>Habitat</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Grass-pink/ Calopogon tuberosus
			REPT	Northern Pine Snake/ Pituophis melanoleucus melanoleucus
				Southern Five-lined Skink/ Eumeces inexpectatus
		Seep/Constant Water	P-DIC	Cross-leaf Milkwort/ Polygala cruciata var. cruciata
			P-MON	Globe Beaked-rush/ Rhynchospora globularis var. globularis
		Shrub/Sapling Condition	REPT	Southern Five-lined Skink/ Eumeces inexpectatus
		Sphagnum Associate	P-MON	Grass-pink/ Calopogon tuberosus
		Tract Size (Area Sensitive)	BIRD	Cerulean Warbler/ Dendroica caerulea
				Pine warbler/ Dendroica pinus
				Yellow-throated Warbler/ Dendroica dominica
		Tree and Snags (Cavity Nesters)		Red-cockaded Woodpecker/ Picoides borealis
				Red-headed woodpecker/ Melanerpes erythrocephalus
		Trees > 20" dbh		Blackburnian warbler/ Dendroica fusca
				Cerulean Warbler/ Dendroica caerulea
				Red-cockaded Woodpecker/ Picoides borealis
				Yellow-throated Warbler/ Dendroica dominica
		Upland (usually mesic to dry, not subject to holding water)		Yellow-throated Warbler/ Dendroica dominica

Viability Assessment Report For Riparian Habitat Association

Prepared by
David D. Taylor
Daniel Boone National Forest

I. Description of Habitat Association

Six distinct habitat types are included in this association. All occur in conjunction with stream corridors. The habitats are related in proximity to a stream, and the function of ground and surface water within the habitats. Three habitat types are found within the stream channel itself: Sand/Gravel/Cobble Bars, Boulder (Scour) Bars, and Stream Banks. The other three are found on a stream floodplain or terrace; these are Eastern River Front Forest, River Floodplain Forest and Canebrakes. Each of the six habitats will be addressed individually. In addition, Swamp, and several grassland types, which may occur in a riparian setting on floodplains or terraces, are described under the Seeps/Swamp Habitat and Grasslands Habitat Associations.

A. Sand/Gravel/Cobble Bars

This habitat type occurs along larger streams and rivers. It occurs on all districts of the Daniel Boone National Forest (DBNF), and probably to some degree, within each of the landtype associations (LTAs) found on the forest. They are most common on streams cut through sandstone dominated areas. It is found at stream's edge just above the normal summer water level to about 6 ft (2 m) above the normal summer water level. As the name implies, it is composed of a combination of sand, gravel or cobble, any combination of which may be dominant at a particular site. Sandstone, shale and coal are the most common rock types, but limestone may be present or even dominant in a few locations. Soils are not developed on these sites, consisting only of sand (0.5-4 in, 1-10 cm deep) or a thin organic duff. Water shapes and maintains these sites. Floods scour live and dead woody vegetation, sand and rock materials off of the bars, and deposit dead woody material, sand and rock materials on the bars. Winter and spring flood events, which scour the bars, are frequent. The sites may pass through several summers in a row without scouring or be scoured multiple times in one summer.

Photosynthesis is the major source of energy for this habitat type. The associated stream brings a variety of organic materials to the sites during the year. Leaf and wood material fall from adjacent and on-site vegetation providing additional energy sources.

When vegetated, the habitat is dominated by herbaceous species. Frequently the species are those associated with prairie flora such as big and little bluestems, false indigo, asters, spiked goat's-rue, and goldenrods. Smartweeds and wild ramie are also common. Woody species found on the bars include poison ivy, shrub dogwood, white pepperbush, and

stunted individuals of sycamore, river birch and red maple. Occasionally a larger individual of sycamore or river birch is found.

B. Boulder (Scour) Bars

This habitat type occurs along larger streams and rivers. It occurs on all districts of the DBNF, and probably to some degree, within each of the LTAs found on the Forest. They are most common on streams cut through sandstone dominated areas. It is found at stream edge just above the normal summer water level to about 6 ft (2 m) above the normal summer water level. Boulder bars often occur in association with sand/gravel/cobble bars, frequently forming a complex gradation of habitats including pockets of sand, gravel and organic matter. In some cases, the boulder bars are immediately adjacent to the stream, and may extend into the stream forming rapids and chutes. Sand/gravel/cobble bars may form on the land side of these boulder bars. In other cases, sand/gravel/cobble bars may be adjacent to the stream, and the boulder bars behind them on the land side. Sandstone is the most common rock type, but limestone may be present or even dominant. Soils are not developed on these sites, consisting only of pockets of sand (1-10 cm, 0.5-4 in deep) or thin organic duff. Water shapes and maintains these sites. Floods scour live and dead woody vegetation, sand and rock materials off of the bars, and deposit dead woody materials, sand and rock materials on the bars. Winter and spring flood events, which scour the bars, are frequent. The sites may pass through several summers in a row without scouring or be scoured multiple times in one summer.

Photosynthesis is the major source of energy for this habitat type. The associated stream brings a variety of organic materials to the sites during the year. Leaf and wood material fall from adjacent and on-site vegetation providing additional energy sources.

The vegetation on these sites is sparse, restricted to pockets of sand or gravel, or where a plant is protected in a crevice from the worst of flood events. Most of the vegetation on these sites is dominated by herbaceous species. Frequently the species are those associated with prairie flora such as big and little bluestems, false indigo, asters, spiked goat's-rue, and goldenrods. Smartweeds and wild ramie are also common. Woody species found on the bars include poison ivy, shrub dogwood, white pepperbush, river grape, and stunted individuals of sycamore, river birch and red maple. Occasionally a larger individual of sycamore or river birch is found.

C. Stream Banks

This habitat type occurs along streams and rivers of all sizes. It occurs on all districts of the DBNF, and within each of the LTAs found on the Forest. The best developed, and most distinct, stream banks form on streams of 2nd order and larger. As defined here, it may be found at stream edge just above the normal summer water level to about 10 ft (3 m) above the normal summer water level. The transition from stream to bank may be gradual and nearly level, to abrupt and nearly vertical. Underlying rock may be sandstone, shale, siltstone, or limestone. Soils range from sand to clay with all textures between represented. Water shapes and maintains these sites. Floods scour live and dead woody vegetation, sand and rock materials off of the banks, and deposit dead woody

materials, sand and rock materials on the banks. Erosion can undercut the more vertical banks reshaping them and the habitat they provide, while deposition can build up the more level sites. Winter and spring flood events, which shape the banks, are frequent. The sites may pass through several summers in a row without flooding or be flooded multiple times in one summer.

Photosynthesis is the major source of energy for this habitat type. The associated stream brings a variety of organic materials to the sites during the year. Leaf and wood material fall from adjacent and on-site vegetation providing additional energy sources.

The vegetation on these sites varies widely depending on the stream characteristics and the characteristics of the surrounding area. Along smaller, flatter streams in sandstone areas with mesic forest cover, mosses and liverworts may dominate the stream bank. Along larger streams with higher gradient, but similar forest cover, woody species such as yellowroot, mountain pepperbush, and Carolina allspice may dominate. Steep banks are often unvegetated or they may be covered with herbaceous species such as smartweeds, clearweed, streamside aster, Virginia wild ryegrass and meehania. Woody species such as shrub dogwood, witch hazel, white pepperbush, poison ivy, and steeplesjack may also be present. Occasionally trees are present; these may be any of the typical floodplain or mesic forest species. Limestone dominated areas have similar vegetation, but tend to have steeper banks. In open or disturbed areas, invasive species often are the dominants. Commonly found species include potato vine, Japanese knotweed, Japanese honeysuckle, Nepalese browntop, and kudzu. In limestone areas, shrub honeysuckle may also be present.

D. Eastern River Front Forest

This habitat type usually occurs along larger, low gradient streams and rivers. It occurs on all districts of the DBNF, and probably to some degree, within each of the LTAs found on the Forest. It occurs within floodplains, if at all, on slightly elevated ground immediately adjacent to the edge of a stream or river, hence the name 'River Front Forest.' The size of this elevated area varies from 3-16 ft (1-5 m) wide and can be 0.1 to 0.5 mi (0.2 to 0.8 km) long or longer. The habitat type occurs on shale/siltstone, limestone and sandstone/conglomerate rock. Soils are well-drained and usually sandy loams. This habitat type is subject to flooding and sediment deposition/erosion throughout the year. Usually water levels rise and fall quickly, and flooding seldom persists longer than a few days. The well-drained nature of soils present reduces water logging of roots. Streams adjacent to this habitat type are perennial.

Photosynthesis is the major source of energy for this habitat type. Water flow also provides energy to the system. It also brings in large amounts of both inorganic and organic material, including but not limited, to soil, leaves, and wood. Other energy sources come from leaves and branches falling from vegetation at and adjacent to the site.

Trees dominate the vegetation. Species usually found are sycamore and river birch. Slippery elm, hackberry and black cherry are sometimes found. These species tolerate periodic flooding, but benefit from the well-drained soils and slightly higher ground on

which they sit. There usually is not a shrub layer and the herbaceous layer is usually composed of annuals such as clearweed and jewelweed.

E. River Floodplain Forest

This habitat type usually occurs along larger, low gradient streams and rivers. It occurs on all districts of the DBNF, and within each of the LTAs found on the Forest. It occurs on the floodplain, usually on the first terrace, but is not restricted to it. River Floodplain Forest occurs behind (distal to the stream) the Eastern River Front Forest if the latter is present. It may be lower than or higher the Eastern River Front Forest depending on the terrace on which it is located. The floodplain forest can be 16-650 ft (5-200 m) or more wide and can be 0.1 to 1 mi (0.2 to 1.6 km) long or longer. The habitat type occurs on shale/siltstone, limestone and sandstone/conglomerate rock. Soils are a mixture of well drained, and poorly drained, sandy to clayey loams and heavy clays. Many have fragipans and remain more or less water logged throughout the year. This habitat type is subject to flooding and sediment deposition/erosion throughout the year. Water levels rise quickly during floods, but may remain high for days or a week or so after the flood event. Streams along which this habitat type occurs are perennial. A variant of this type occurs along the backwaters of Cave Run Lake, where flooding is in part controlled by the water level in the lake. As a result, the floodwaters may remain high for several weeks.

Photosynthesis is the major energy source for the habitat type. Water flow also provides energy to the system. It also brings in large amounts of both inorganic and organic material, including but not limited, to soil, leaves, and wood. Other energy sources come from leaves and branches falling from vegetation at and adjacent to the site.

Trees dominate the vegetation. Which species are found depends on the soils in a particular area. In areas with well-drained soils, species such as sycamore, river birch, tulip poplar, Ohio buckeye, slippery elm, and black cherry may be encountered. These species tolerate periodic flooding, and benefit from the well-drained, fertile soils, and adequate moisture. In poorly drained areas, sweet gum, black willow, red maple, silver maple, boxelder, and river birch may be found. Shrubs found are often the same on all soil types and include spicebush, shrub dogwood, poison ivy, and witch hazel. Herbaceous species differ somewhat by soil type. On the wetter sites, species such as smartweeds, wild ramie, deertongue, caric sedges, and rushes may be found. On drier sites, an array of species ranging from common spring wildflowers to streamside aster, Virginia wild ryegrass, ironweed, and wingstem may be found.

F. Canebrakes

This habitat type is found across the forest on all districts and probably within all LTAs on the forest. On the forest, it is associated with river floodplains, although it occasionally occurs in depauperate form in upland positions. Floodplain canebrakes are usually dense monocultures whereas upland canebrakes usually are sparse and mixed with other species. Canebrakes may occur on any of the common geologic types found on the forest. Soils are well drained, and often sandy loams. These areas are subject to flooding throughout the year, but water recedes from them quickly.

Photosynthesis is the major source of energy for this habitat type. Water flow also provides energy to the system. It also brings in large amounts of both inorganic and organic material, including but not limited, to soil, leaves, and wood. Other energy sources come from leaves and branches falling from vegetation at and adjacent to the site.

The dominant vegetation in canebrakes is cane. Canebrakes are usually composed of just cane without any other species present. The cane is dense providing little growing room or sunlight for any other species. Forest is often along one side of the brake and may somewhat shade it.

II. Current Status of the Habitat Association on the Daniel Boone National Forest

To date, there has been no systematic survey for any of the riparian habitats on the DBNF. However, cooperative rare species inventories conducted between 1987 and 1993 (USDA Forest Service et al., 1988-1994) identified many locations for sand/gravel/cobble bars and boulder bars, and a few locations for river floodplain forest. Project species surveys have identified others. Data on known locations are not yet organized in spatial or tabular databases. About 25 locations for bars with rare plants on them are known, all from the Cumberland River drainage. Another two sites are known for River Floodplain Forest with unusual vegetation, both from the Cumberland River drainage. Several canebrakes are recorded from the northern end of the Forest, but others exist. Eastern River Front Forest is present on, and dispersed across, the DBNF. Stream bank habitat is present across the forest. The extent of all of these habitats is unknown. The following information is available. Around 5540 mi (8900 km) of stream, from 2nd to 9th order, are present on the DBNF. Of this, about 2714 mi (4370 km) is 3rd order or higher, which are likely to have a stream bank with habitat distinct from the surrounding land. Sand/gravel/cobble and boulder bars usually form along streams of 4th order or higher, of which there are about 751 mi (1210 km) on the DBNF. River Front Forest, River Floodplain Forest and Canebrakes are usually associated with 3rd order or higher streams, of which there are about 1394 mi (2240 km) on the DBNF (USDA Forest Service, 2001a). Land within the proclamation boundary, but not within DBNF ownership, includes about 6,000 miles (9650 km) of stream.

Stream miles present today are unlikely much changed from the miles present 200-300 years ago. The condition of the streams and associated habitats probably has changed. Land clearing over the last 200 years removed forest and canebrake vegetation from along larger streams to open land for cultivation. Some of this removed forest has grown back, but little of the cane has. Sand/gravel/cobble and boulder bars are in part a function of erosional processes. Changes in vegetation along streams directly or indirectly would have altered some of the bars, possibly removing some and creating others. Stream bank conditions have changed over the last 200-300 years as a result of natural processes and cultural influences such as clearing, farming, and the build of roads. Today there are fewer miles of wooded stream bank than were present 200-300 years ago, but more exist now on the DBNF than during the early 1900s. Between about 1900 and 1930, most of the land now comprising the DBNF was cut over and burned. This undoubtedly had an effect on these habitats.

A riparian management area (RMA) has been identified for the DBNF using GIS (USDA Forest Service 2001). This model does not identify which habitat type is present, but rather if

a particular piece of ground falls within the riparian zone. The model assigns 33 ft (10 m) to either side of 2nd order streams, 66 ft (20 m) to either side of streams 3rd order or greater, and includes all calculated riparian area to the 100 year floodplain (based on 10 m digital elevation model or DEM) of any size stream if greater than the model minimum. The model does not calculate a riparian zone for 1st order streams. Within the proclamation boundary, the model calculates 612,148 ac (247,729 ha) of riparian management area. Of this, 159,412 ac (64,512 ha) is on National Forest. As 60,349 ac (24,422 ha) of this total are accounted for by the minimum 33 ft and 66 ft zones, 99,063 ac (40,090 ha) represents the additional 100 year floodplain area outside these zones as calculated by DEM. It is in this area, the area of widest floodplain development, that Eastern River Front Forest, River Floodplain Forest, and Canebrakes are most well developed.

While much of the Cumberland Plateau is still wooded, including riparian areas, the land comprising the DBNF is more likely to maintain intact riparian habitats than other lands. The need for flat land in the business and private sectors encourages the clearing and draining of floodplain and terrace lands. Management on the DBNF is expected to clear or drain little, if any, riparian habitat.

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The management goal for the riparian habitat association is to maintain or improve the physical, chemical and biological conditions that will result in continued functioning of the riparian system, and in a high likelihood that species within this association will persist on the forest over the planning period. (FLRMP, IV: 69,79, in part, Aquatic Assessment, p 48)

The strategy to accomplish this goal focuses on maintaining zones of limited disturbance within the habitat association. Additional standards and guidelines are also recommended when other protective measures are needed to insure the viability of a particular species associated with this habitat association.

The desired future condition of this habitat association is a generally undisturbed area within and adjacent to the riparian zone along streams, in which biological systems composed of native species, and the occasional desirable non-native species contribute to the health and natural function of riparian and aquatic systems. (Aquatic Assessment, p 49)

1. Habitat Association General Direction and Standards and Guidelines (S&G)

A. Management activities are restricted within the riparian zone

- Riparian zones forest-wide will be managed to retain a zone of generally forested and generally undisturbed (by management) ground between the stream or lake and the extent of the riparian zone (see GIS model for this area).
 - *Rationale: With rare exception, riparian zones in the east are dominated by forest vegetation. Riparian and aquatic systems evolved with forested vegetation.*

- Except on a site-specific basis, and where necessary for habitat requirements of PETS or other species at risk, areas of bare soil on stream banks and in the riparian zone will be vegetated to native or other noninvasive species, as funding and personnel allow. (Aq. Ass., p 49, in part)
 - *Rationale: While sediment derived from erosion is natural, the amount is dependent on inherent characteristics of the riparian and stream system. Alterations in vegetation or other characteristics change erosional and sedimentation rates. Some bare ground in riparian systems is natural, and species have evolved to make use of this.*
- On a site-specific basis, activities including vegetation management, can be permitted when the objective is to improve habitat conditions for PETS species.
 - *Rationale: Management activities are sometimes necessary to maintain or enhance individual species habitats.*
- Activities such as rights-of-way, foot trails, and scenic vistas may be permitted in the riparian zone as long as they do not negatively impact PETS species, their potential habitat, or degrade riparian function to an unacceptable degree. (FLRMP, IV:41,129; in part)
 - *Rationale: Limited use of the riparian zone may not affect species viability on a site-specific basis. New rights-of-way are permitted when a cleared corridor is not required.*
- Trails for motorized vehicles, horses, bicycles and other non-pedestrian means of transportation are not permitted in the riparian zone except at designated crossings and where, legal, on system roads. (Aq. Ass., p 58)
 - *Rationale: These kinds of trails have great potential to increase erosion in the riparian area and increase sediment in streams. They also increase the likelihood of invasive exotics introductions.*
- Existing system roads within the riparian zone will be analyzed for their continued need. If needed and if possible, roads will be moved out of the riparian zone and the old road put to bed with native or other non-invasive species. If needed and the current location is the only possible one, roads will be brought to, and maintained at, a standard commensurate with their use AND protection of the riparian and aquatic systems. (FLRMP, IV:30-32, 44; in part)
 - *Rationale: Roads disrupt hydrology of riparian and other systems. Minimizing the number of roads within the riparian zones improves the health and function of the system. When roads are necessary within the riparian zone, their construction and maintenance will be such as to prevent damage to the riparian zone or stream/lake.*

- New roads will be constructed outside of the riparian area, with the exception of necessary stream crossings. Crossings are to be at right angles to the stream and placed to provide the least disturbance to stream bank and channel while minimizing erosional potential. Approaches to crossings will be hardened to reduce or prevent erosion. (FLRMP, Amend. 7; in part)
 - *Rationale: Roads disrupt hydrology of riparian and other systems. Roads will at times cross streams. When they do, the placement and design of crossings should reduce or eliminate erosion of approaches and stream banks.*
- Nonforest vegetation openings are permitted within the riparian zone, but only when the habitat is needed for PETS or other species at risk. Where possible, these areas should be combined with other uses to minimize the amount of nonforest area in the riparian zone.
 - *Rationale: PETS and other species at risk may require habitat conditions not currently present. Nonforest condition is natural in riparian areas, but is of limited extent. Where other uses of the habitat do not harm the species, combining uses maintains more of the riparian zone in forest cover.*
- Manipulation of vegetative cover in the riparian area is not permitted within 5 ft of a stream or lake bank, except for the control of invasive exotic plants. When invasive species are treated, other vegetative cover will be immediately promoted if soil is exposed. Exceptions are also permitted for occasional low intensity backing fires, and single tree cutting, generally from the midstory, in seeps and wetlands that are part of a stream system. (FLRMP, Amend 7; in part)
 - *Rationale: The vegetation immediately adjacent to the bank is vital to maintain bank integrity. Invasive species on and near banks, however, rapidly take over native vegetation changing riparian characteristics. Some PETS or other species at risk require higher light conditions than may be found in some seeps or wetlands.*
- Remove invasive species from sites occupied by PETS species with as little interruption to PETS species as possible. As funding and personnel allow, remove invasive weeds from other areas within riparian zones.
 - *Rationale: Invasive species can rapidly spread in riparian zones, aided by flowing water. These species have great potential to modify and render marginal, habitat for PETS species.*
- Rehabilitate riparian habitat where it is degraded to improve riparian function when such action is expected to provide for conditions better than existing. Limit use of vehicles to the minimum needed to accomplish the project. (Aq. Ass., p. 49; in part)

- *Rationale: Management can improve riparian function when it is degraded. However, such activities must have a reasonable chance of improving conditions, and must not in and of themselves cause degradation.*
- Existing nonforest vegetation will be surveyed and analyzed for composition and structure. Areas of native vegetation will not be altered except as needed for management of PETS or other species at risk. Areas of nonnative vegetation, especially those with invasive species, may be converted to forest, other grassland types or other appropriate habitat.
 - *Rationale: Nonforest vegetation in riparian areas of the east is generally uncommon. If composed of native species, these areas should be maintained as rare communities, and habitat for PETS species or other species at risk.*
- Canebrakes will be encouraged on appropriate existing openings in riparian areas when the openings are not needed for PETS or other species at risk.
 - *Rationale: Canebrakes are part of the native vegetation found on the riparian system. This habitat type is extremely limited on the forest, but was once more common.*
- Prescribed fire is permitted in riparian areas as long as it is low intensity and short duration fires. Exceptions can be made for canebrake and other grassland management when site-specific analysis shows, with or without mitigation, impacts no greater than from low intensity, short duration fires would occur on the adjacent aquatic systems. (FLRMP, Amend 7; in part)
 - *Rationale: Fire was, under most circumstances an infrequent, and low intensity occurrence in riparian areas. Areas of cane and other grasslands, however, burned with some increased frequency and intensity.*
- Fire control lines will not be built in the RMA unless connecting to a stream or lake as part of landscape burns or wildfire control. Except in cases of wildfire, all such lines will be constructed by hand. Any exposed mineral soil is to be seeded with native or other non-invasive species within a week of burning or fire control. Water bars and other water control devices are to be used to prevent concentration of water and energy in a few areas. (FLRMP, Amend 7; in part)
 - *Rationale: Fire breaks utilizing streams and lakes increase efficiency in large scale burning. Crossing riparian areas is necessary to complete the line. Hand lines are less damaging to the riparian system than tractor lines, but still need rehabilitation to prevent damage to the system.*
- Snags should be maintained at 3-5 per 1.0 mile of riparian zone length. Snags should be at least 12" dbh, and if available, at least one should be 20" or greater dbh. Create snags by girdling where needed,

- *Rationale: Snags are important habitat requirements for many species using riparian habitat. Fully functional riparian zones would include snags. Creating snags also creates canopy gaps, which promote localized dense shrubby areas, another habitat component required by many riparian zone species.*
- Salvage of dead and dying trees may occur in riparian zones for maintaining health or improving habitat of the riparian areas long as other S&Gs are met and the over all function of the riparian zone, and viability of species at risk are not compromised by such action. (Aq. Ass., 58; in part)
 - *Rationale: High density of dead and dying trees may contribute to other resource problems in the riparian zone. Removal of some of this material is acceptable if in the process other damage does not occur.*
- Corridors for cable logging in areas adjacent to riparian zones will cross the riparian zone only after consultation with and approval by, DBNF biologists AND hydrologists. Full suspension is required when yarding logs across perennial and intermittent streams. (Aq. Ass., p 58; in part)
 - *Rationale: On a site-specific basis, a cable logging path, properly rehabilitated, may not cause serious harm to the riparian or aquatic system. Both biotic and abiotic concerns are to be considered.*
- Trees may be singly selected for cutting to provide CWD for stream or lake habitat improvement. Trees are to be moved to and placed in streams or lakes without vehicular support, if at all possible. (Aq. Ass., p 58; in part)
 - *Rationale: Large dead wood in streams and lakes is important to stream and lake health. Placement of this material may improve habitat both in the stream or lake and in the riparian zone for species at risk, but should be done without causing damage to the zone or stream or lake in the process.*
- Large dead wood (6" and up dbh) will be left in the riparian zone during salvage or other management activities potentially removing this material. (Aq. Ass., 50; in part)
 - *Rationale: Large dead wood in streams is important to stream health. The natural source for this material is primarily from riparian zones.*
- Drilling pads and production facilities for oil, gas, or mineral extraction are located outside of the riparian zone. Removal of mineral materials from the riparian zone or stream channel is prohibited. (Aq. Ass., 58)
 - *Rationale: These facilities have great potential for serious and immediate harm to both riparian zones and streams. Removal of mineral materials from either riparian zones or streams can cause dramatic hydrologic changes in*

the stream, and damage to downstream property, resources and species at risk.

- Impoundments are generally prohibited, but may be approved, by both the fisheries biologist and hydrologist on a site-specific basis.
 - *Rationale: Impoundments have high likelihood of disrupting both riparian zones and aquatic systems and their function. On a site-specific basis, analysis may show acceptable changes in either or both systems.*
- Protective measures such as informational signing, posting sites closed and/or barrier construction may be applied to sites that are receiving resource damage through inadvertent human activity.
 - *Rationale: Human use of site-specific areas may need to be modified or restricted.*
- Riparian areas identified for disposal in land adjustments will be analyzed for their contribution to watershed health, habitat for species at risk, and potential for new use to degrade either. (FLRMP, IV:43; in part)
 - *Rationale: Healthy riparian areas are essential to maintain healthy aquatic habitat. Forest Service management of riparian areas compared to reasonably expected management in other ownership is necessary as part of the decision process.*
- Camping and fire building will be prohibited in riparian areas, except at developed recreation sites and other designated sites. (Aq. Ass., p 58; in part)
 - *Rationale: Camping in specific areas may serve to invite unwanted, inadvertent use of areas important to maintaining species viability.*
- Recreational developments are permitted in riparian zones as long as they do not cause unacceptable resource damage. If rehabilitation will correct the problems, sites may remain open. Otherwise, they are to be closed. (Aq. Ass., p 58)
 - *Rationale: Riparian zones offer numerous recreational opportunities. As long as riparian and associated stream or lake resource values are not appreciably compromised, access to the areas are permitted.*
- Management activities concentrating public use in the vicinity of sensitive riparian areas would be avoided if detrimental impacts were likely to occur.
 - *Rationale: Site-specific activities need to be evaluated to determine the level of potential inadvertent human impacts to species associated with this habitat association.*

B. Protect or enhance habitat for PETS species.

- Manipulation of existing forest cover adjacent to riparian zones is expected. During timber harvest or other activities, provide for irregular boundaries between the riparian zone and the edge of project area. Feathered edges with varying BA should be created.
 - *Rationale: Abrupt changes in habitat can create barriers for many species. Gradual changes are less likely to do so. This also helps maintain a corridor between the riparian area and upland habitat.*
- Potentially disturbing activities in this area will be mitigated or eliminated, and habitat improvements (such as waterholes) prescribed to enhance suitability will have minimal effect on the riparian system.
 - *Rationale: Existing activities should be evaluated to determine effects and habitat improvement needs that may need to be added on a site-specific basis should also consider effects.*
- Sites providing potential (undocumented) habitat for PETS or other species at risk will be managed according to guidelines established for the riparian zone.
 - *Rationale: Many specific habitat features likely remain undetected or unreachable in the riparian zone. These sites may or may not contain populations of PETS or other species at risk. The riparian zone will provide a protection zone for all riparian-associated habitat features such as seeps and wetlands on the forest.*
- Acquire private lands from willing sellers with known PETS species riparian sites or riparian sites including potential habitat for PETS species. (FLRMP, IV:79-80; in part)
 - *Rationale: Riparian habitat, especially that supporting PETS species, is critical to maintain the health of riparian systems and adjacent streams. Federal ownership of riparian areas and streams better enables cooperating agencies to management for these systems.*

Protect, maintain and enhance Indiana bat roosting, foraging and maternity habitat in the general forest area. (Unless otherwise noted, the standards and guidelines are current Forest Plan direction.)

- Tree cutting activities, involving currently suitable or potential roost trees, will not be conducted within two and one half miles of an Indiana bat maternity colony between 1 May and 15 August.
 - *Rationale: Female Indiana bats frequently forage up to 2 ½ miles from their maternity colony site. Tree cutting activity in this area during the maternity*

period decreases their chance to successfully raise their young. (USFWS current best available knowledge)

- Generally, currently suitable roost trees (SHNS EA, Chapter VII) may be removed between 1 Dec and 15 March. If removal occurs at other times, trees must be evaluated for bat use by a trained observer the evening prior to tree removal.
 - *Rationale: During the 1 Dec to 15 March time period Indiana bats are in hibernation and will not be routinely roosting under the bark of trees. At other times of the year Indiana bats may be utilizing specific currently suitable roost trees.*
- Every effort will be made to retain existing snags within project areas except where they would interfere with the project purpose and need.
 - *Rationale: Snags provide important habitat conditions for roosting Indiana bats and should be retained if at all possible within project areas. Snags should not be intentionally felled in these areas. It is also recognized that the purpose and need of some projects will preclude leaving any snags within the immediate project area.*
- Snags that are considered to be an immediate threat to human safety may be removed at any time.
 - *Rationale: While it is recognized that the removal could occur during the Indiana bat roosting season, the safety of humans is of paramount importance.*
- Snags identified as hazards but not immediate threats to human safety will only be removed during the hibernation season (December 1 - March 15).
 - *Rationale: Snags within project areas that are designated for removal should be removed at a time when this activity does not present a threat to roosting Indiana bats.*
- Some snags may be removed as incidental loss associated with project activities such as skid trails, log landings and roads, etc. The accidental felling of a snag, that is 9 inches or greater dbh, is reportable to the Forest T&E biologist and the USFWS.
 - *Rationale: It is recognized that some inadvertent loss of snags will occur. The accidental felling a snag 9 inches or greater dbh is by definition not part of the analysis of the proposed action. Thus, these trees should be reported, as described above, in order to fully determine annual effects on the Indiana bat roosting/foraging habitat.*
- Prescribed burning will not occur in areas of Indiana bat roosting habitat between 1 May and 15 August.

- *Rationale: During the maternity season non-volant juvenile Indiana bats roosting under tree bark or in snags may be killed by the heat or smoke associated with prescribed fire. (USFWS current best available knowledge)*

Maintain and enhance roosting and foraging habitat during projects designed to manage overstory vegetation. (Unless otherwise noted, the standards and guidelines are current Forest Plan direction.)

- No snags will be intentionally felled within project areas associated with timber management. Within these areas at least three snags per acre need to be over 9 inches in dbh.
 - *Rationale: Snags are important as Indiana bat roosting habitat and should be retained in timber sale areas.*
- Live trees within a regeneration project area will be girdled if the existing density of standing dead trees does not meet the three per acre standard.
 - *Rationale: If the area does not contain at least three, 9 inch dbh or greater snag per acre, additional trees will be killed to provide this needed habitat component.*
- Retain live trees adjacent to 1/3 of all snags over 12 inches dbh to provide partial shading.
 - *Rationale: A variety of microclimate conditions are needed by roosting Indiana bats, especially during the maternity season. By providing shade on some of the large snags a variety conditions will be maintained within the project area.*
- Retain a minimum of 10 to 15 square feet basal area of potential roost trees (where available: see Table 1, DN, SHNS Amendment) of a minimum size of 9 inches dbh per acre, on a stand average. Larger trees are preferred.
 - *Rationale: Retaining trees within the project area provides suitable habitat of foraging and future roosting habitat for Indiana bats. Trees do not need to be retained on a uniform distribution basis, but rather should occur on a stand average basis to maximize the ecological potential of the site.*
- Retain all shagbark, shellbark and red hickories that are at least pole size (6 inch dbh) or greater.
 - *Rationale: These species of hickory trees possess outstanding exfoliating bark characteristics and are highly desirable as roost sites by Indiana bats.*
- Retain all immediate roost trees regardless of size (SHNS EA, Chapter 7). These trees must be physically identified prior to project initiation. Should these trees be felled during project activity the Forest T & E Biologist and the USFWS shall be contacted.

- *Rationale: Immediate roost trees provide the necessary characteristics to be used as roost sites by Indiana bats. These trees are marked prior to project initiation because they are difficult to recognize and marking will insure that they are retained during the duration of the project.*
- Design boundaries of harvested area shall be irregular in shape.
 - *Rationale: Irregular boundaries provide additional linear area for Indiana bats to forage within a project area. Standing trees, utilized for overhead cover and roosting are immediately adjacent to open foraging areas.*
- Distribute some of the leave trees in clumps or strips containing 50 square feet of basal area per acre or 1/2 the density of the original stand whichever is greatest in order to provide travel/foraging habitat corridors.
 - *Rationale: Indiana bats travel and forage in areas where understory vegetation does not inhibit their flight path. Retaining overhead cover in clumps and strips will provide travel corridors and foraging areas not otherwise available in timber sale areas.*
- Some snags may be removed as incidental loss associated with project activities such as skid trails, log landings and roads, etc. The accidental felling of a snag, that is 9 inches or greater dbh, is reportable to the Forest T&E biologist and the USFWS.
 - *Rationale: It is recognized that some inadvertent loss of snags will occur. The accidental felling of a snag 9 inches or greater dbh is by definition not part of the analysis of the proposed action. Thus, these trees should be reported, as described above, in order to fully determine annual effects on the Indiana bat roosting/foraging habitat.*

IV. Management Needs: Monitoring and Inventory Considerations to Ensure Species Viability

- Maintain an inventory of riparian areas with spatial and tabular attributes including but not limited to, location, size, type of habitat, condition, and the presence of any species at risk. (High Priority)
 - *Rationale: An inventory of riparian habitat provides information on which to base management decisions, track yearly and plan period maintenance accomplishments, and estimate habitat suitability for various species at risk.*
- Monitor MAR and other reporting systems to help determine accomplishments for each year and the planning period. (High Priority)
 - *Rationale: MAR and other reporting systems will be filled out yearly. Use data as reported to help verify inventory.*

- Conduct systematic inventories of all uncommon or rare forested or non-forested riparian habitat on the Forest. (High Priority)
 - *Rationale: This increases known information for riparian habitat and the species that use them. The information improves management of riparian areas and the species using them.*
- Monitor riparian areas for resource degradation related to recreational activities. (High Priority)
 -
- Monitor riparian areas for invasive exotic species, primarily plants, which may compromise habitat conditions. (High Priority)
 - *Rationale: Invasive exotics can spread quickly, taking over and rendering unusable or marginal riparian habitat, as well as choking out plants at risk.*

References:

- USDA Forest Service. 2001a. Riparian zone: GIS coverage. US Department of Agriculture, Forest Service, Southern Region, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service. 2001b. Streams: GIS coverage. US Department of Agriculture, Forest Service, Southern Region, Daniel Boone National Forest. Winchester, KY.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1988. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Somerset Ranger District. Winchester, KY. 245 pp.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1989. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stanton Ranger District. Winchester, KY. 316 pp.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1990. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stearns Ranger District. Winchester, KY. 170 pp.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1991. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Berea District. Winchester, KY. 125 pp.

USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1992. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Morehead Ranger District. Winchester, KY. 184 pp.

USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1993. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Redbird Ranger District. Winchester, KY. 184 pp.

USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1994. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, London Ranger District. Winchester, KY. 252 pp.

USDA Forest Service. 2001. GIS data: Riparian Management Area coverage. U.S. Department of Agriculture, Forest Service, Southern Region, Daniel Boone National Forest. Winchester, KY.

USDA Forest Service. 2001a. GIS data: Stream coverage. U.S. Department of Agriculture, Forest Service, Southern Region, Daniel Boone National Forest. Winchester, KY.

Attachment A.

Species List: Riparian Habitat Association

Class	Common Name/ Species
ANIMALS	
Birds	Wood Duck/ <i>Aix sponsa</i> Cerulean Warbler/ <i>Dendroica caerulea</i> Acadian Flycatcher/ <i>Empidonax virescens</i> Bald Eagle/ <i>Haliaeetus leucocephalus</i> Wood Thrush/ <i>Hylocichla mustelina</i> Swainson's Warbler/ <i>Limnithlypis swainsonii</i> Hooded Merganser/ <i>Lophodytes cucullatus</i> Kentucky Warbler/ <i>Oporornis formosus</i> Eastern Towhee/ <i>Pipilo erythrophthalmus</i> Pied-billed Grebe/ <i>Podilymbus podiceps</i> Prothonotary Warbler/ <i>Protonotaria citrea</i> Louisiana Waterthrush/ <i>Seiurus motacilla</i> Hooded Warbler/ <i>Wilsonia citrina</i>
Insects	Cliff Caddisfly/ <i>Manophylax butleri</i>
Mammals	Beaver/ <i>Castor canadensis</i> Gray Bat/ <i>Myotis grisescens</i> Eastern Small-footed Bat/ <i>Myotis leibii</i> Indiana Bat/ <i>Myotis sodalis</i> River Otter/ <i>Lutra (Lontra) canadensis</i> Southeastern Myotis/ <i>Myotis austroriparius</i>
Reptiles	Northern Coal Skink/ <i>Eumeces anthracinus anthracinus</i> Eastern Ribbon Snake/ <i>Thamnophis sauritus sauritus</i>
PLANTS	
Dicots	Running Serviceberry/ <i>Amelanchier stolonifera</i> Rockcastle Aster/ <i>Aster saxicastellii</i> Spreading False Foxglove/ <i>Aureolaria patula</i> False Indigo/ <i>Baptisia australis</i> var. <i>australis</i> Prairie Redroot/ <i>Ceanothus herbaceus</i> American Golden-saxifrage/ <i>Chrysoplenium americanum</i> Sweet-fern/ <i>Comptonia peregrina</i> Cumberland Rosemary/ <i>Conradina verticillata</i>

Goldenseal/ *Hydrastis canadensis*
 American Water-pennywort/ *Hydrocotyle americana*
 Vetchling Peavine/ *Lathyrus palustris*
 Smooth Veiny Peavine/ *Lathyrus venosus*
 Lesquereux's Bladder-pod/ *Lesquerella globosa*
 Nuttall's Lobelia/ *Lobelia nuttallii*
 Barbara's Buttons/ *Marshallia grandiflora*
 Carolina Anglepod/ *Matelea carolinensis*
 Mock Orange/ *Philadelphus inodorus*
 Hoary Mock Orange/ *Philadelphus pubescens* var. *pubescens*
 Nodding Rattlesnake-root/ *Prenanthes crepidinea*
 Rock Scullcap/ *Scutellaria saxatilis*
 Short-stem Ragwort/ *Senecio pauperculus*
 Southern Oconee bells/ *Shortia galacifolia* var. *galacifolia*
 Riverbar Goldenrod/ *Solidago spathulata*
 Virginia Spiraea/ *Spiraea virginiana*
 Big-flowered Snowbell/ *Styrax grandiflorus*
 Synandra/ *Synandra hispidula*
 Spiked Hoary-pea/ *Tephrosia spicata*
 Slippery Elm/ *Ulmus rubra*
 New York Ironweed/ *Vernonia noveboracensis*
 Sand Grape/ *Vitis rupestris*
 Toothache-tree/ *Zanthoxylum americana*

Gymnosperms

Northern White Cedar/ *Thuja occidentalis*

Liverworts

Liverwort/ *Jubula pensylvanica*
 Liverwort/ *Trichocolea tomentella*

Monocots

Cane/ *Arundinaria gigantea*
 Caric Sedge/ *Carex seorsa*
 Loesel's Twayblade/ *Liparis loeselii*
 Clubspur Orchid/ *Platanthera clavellata*
 White Fringeless Orchid/ *Platanthera integrilabia*
 Small Purple-fringed Orchid/ *Platanthera psycodes*
 Shining Ladies'-tresses/ *Spiranthes lucida*
 Yellow-eyed Grass/ *Xyris tortula*

Mosses

Sword Moss/ *Bryoxiphium norvegicum*
 Closter's Water Hypnum/ *Hygrohypnum closteri*
 Moss/ *Mnium hornum*
 Moss/ *Syrrhopodon texanus*

Attachment B.

Riparian Species/Habitat Relationships with References

ANIMALS

Birds

Wood Duck – *Aix sponsa* – These birds live around a variety of aquatic habitats that have cavities available for nesting. Swamps, wooded streams, lakes, ponds, reservoirs, and marshes provide suitable habitat. Nesting is in live or dead trees, within cavities, hollow limbs, and even abandoned pileated woodpecker holes. Trees utilized are usually near or above water—often in sycamore and maples (Mengel 1965). Artificial nest boxes are widely used. Birds forage in shallow water for aquatic plants, insects, and small fish. In the winter, wood ducks often eat acorns. The wood duck would be likely to be found utilizing the forest immediately adjacent to rivers, larger streams, lakes, and permanent ponds for nesting.

Cerulean Warbler – *Dendroica caerulea* – Cerulean warblers depend primarily on extensive tracts of mature, relatively undisturbed, deciduous forest. These birds occur in floodplains and upland sites that have large trees (> 20" dbh) in which to nest. Both nesting and foraging take place in the canopies of hardwoods. Stands are usually somewhat open, with little understory; however, according to Buehler and Nicholson, monitoring data suggest that breeding territories in the Cumberland Mountains tend to have fewer canopy trees and greater shrub coverage than those elsewhere. The birds are rarely found in tracts less than 250 hectares, whereas maximum population densities occur in tracts greater than 3000 ha (1997). Hamel gives a minimum tracts size of 1750 ha (1992). Loss of bottomland hardwood and forest fragmentation has resulted in decreased numbers of this species. The cerulean warbler would be attracted to the bottomland hardwood forest and natural edge frequently associated with riparian areas.

Least Flycatcher – *Empidonax minimus* – This is a species of open conditions; it is rarely encountered deep in the forest. Open, deciduous woods (particularly those that have been disturbed by burning or logging), forest edge, fields with scattered large trees, and other habitats that provide early successional conditions are utilized. During spring migration, Mengel observed male birds in alders and willows in a marshy, Laurel County meadow (1965). Most of the breeding population frequents elevations above 2500 feet. The least flycatcher would likely be particularly attracted to the marshy backwater areas created by larger rivers and streams, especially where dense woody shrubs are present.

Acadian Flycatcher – *Empidonax virescens* – This species is usually found near water generally near a stream course or some small waterway (Hamel, 1992). It generally uses an open, moderate understory for feeding in a stand with tall trees and closed canopy (DeGraaf et. al., 1991). It is associated with forested tracts at least 37 hectares (91.4 acres) in size (Hamel, 1992). DBNF monitoring data indicates that the greatest number of occurrences for this species were in mesophytic-cove habitats greater than 80 years

old. Acadian flycatchers would be expected to nest and forage in riparian areas that consist of streams with an overhanging canopy and dense shade (L.Perry, pers. obs.).

Bald Eagle – *Haliaeetus leucocephalus* – This federally listed species is dependent on aquatic habitat, primarily river floodplains, lakes, and natural and human-built reservoirs. It utilizes both standing and flowing fresh water sources (and salt water, in coastal areas) that have large trees suitable for nesting, perching and roosting. Suitable trees are at least 20" dbh in size and usually growing near the water (Hamel, 1992). In Kentucky, the birds have nested and wintered around wetland/floodplain habitats and reservoirs resulting from the impoundment of rivers (e.g., Laurel River Lake on the DBNF). Wintering birds are known to occur on major impoundments on the DBNF. Records of attempted nesting exist for Laurel River Lake although no active nests are currently known to exist. The bald eagle would be attracted to the forest along large rivers for nesting and wintering.

Worm-eating Warbler – *Helmitheros vermivorus* – Worm-eating warblers inhabit moist, shady forest on moderate to steep slopes. In eastern Kentucky, the birds are common on deeply shaded slopes in mixed mesophytic woods and moist ravines (Mengel 1965). They are usually found in fairly mature deciduous or mixed forest with a dense understory, preferably of rhododendron and mountain laurel, but will also use younger forest and forest edge. Nesting is typically on sloping ground among leaf litter, while foraging is carried out on the ground or among understory vegetation. Although the species occurs in dissected woodland, it avoids isolated tracts (Palmer-Ball, 1996). Hamel lists the minimum necessary tract size as 370 ha (1992). The worm-eating warbler would be particularly attracted to the steep, hardwood-dominated slopes often found adjacent to streams and rivers.

Wood Thrush – *Hylocichla mustelina* – The Wood thrush is found in a wide variety of forest types, provided a well-developed understory is present. Moderately shaded, deciduous and mixed stands of mature trees with a dense shrub and/or sapling understory are typical habitat, particularly when occurring on moist sites. The species frequently occurs in riparian habitat, rich hardwood and bottomland forests being favored; however, drier sites may be used, so long they have the relatively dense shrub layer. Nesting is in shrubs, vines, and small trees. Although the species will tolerate some fragmentation of habitat, it is most common in extensive forest and requires a minimum tract size of 3 hectares (Hamel 1992). The wood thrush is particularly attracted to the shaded, moist and often dense conditions found along stream corridors and riverbanks.

Swainson's Warbler – *Limnithlypis swainsonii* – This forest interior species is found within tracts of moist, extensive forest that have dense understory. Hemlock ravines, having dense growths of rhododendron and laurel, and bottomland forest, with a well-developed understory and/or thickets of small trees, are favored locations. Dense cane breaks are also used. On the DBNF, this bird is often observed in damp, shady hemlock ravines with an understory of rhododendron, near small streams (L.Perry, pers. obs.). The Swainson's warbler is particularly attracted to the shaded, moist, and often dense, conditions found along stream corridors and riverbanks.

Hooded Merganser – *Lophodytes cucullatus* – This species of waterfowl requires wooded areas with clear water streams, rivers, swamps, ponds, and lakes with cavity trees present (DeGraaf et. al., 1991). Usually forages in freshwater situations such as swamps, ponds or lakes (Hamel, 1992). This species is seldom found far from floodplain situations and usually requires a good stand of fairly mature forest nearby for nest sites (Palmer-Ball, 1996). They require cavities for nesting and may utilize artificial cavities originally constructed for wood ducks (Bellrose, 1980). The hooded merganser would be particularly attracted to the backwater areas of rivers and larger streams, where it can occasionally be found foraging and nesting.

Kentucky Warbler – *Oporornis formosus* – Kentucky Warblers are most frequent in moist, shady, deciduous and mixed (with pine or hemlock) forest types with dense, shrubby understories. However, in Eastern KY they occur in virtually all habitat associations except the most xeric pine and pine-oak communities, and may even invade them (Mengel 1965). Mature stands are required, though some younger stands and shrubby woodland borders are used, as well. These ground-nesting birds forage in understory vegetation, leaf litter, and soil. Unlike several other ground-nesting warblers, the Kentucky occurs regularly in bottomland forests... apparently nesting successfully despite periodic flooding (Palmer-Ball, 1996). The Kentucky warbler is particularly attracted to the shaded, moist, and often dense, conditions found along stream corridors and riverbanks.

Prothonotary Warbler – *Protonotaria citrea* – This species is found in standing water habitats within areas of extensive forest (Hamel, 1992). When birds are seen, they are almost always near water. Swamps, riparian corridors, bottomland/floodplains, willow thickets around lakes and ponds, and reservoir margins that contain snags at least 6" dbh provide potential habitat for these cavity-nesters. Somewhat open swamps with scattered dead stumps or dead trees with cavities are favored nesting sites. The prothonotary warbler would be attracted to the forested areas along large slow moving streams and rivers for nesting and foraging.

American Woodcock – *Scolopax minor* – This species typically requires moist woodlands in early stages of succession. It may use open fields, cultivated land, pastures and clearings at least ¼ acre in size (DeGraaf et. al., 1991). It generally requires poorly drained soils with an abundance of earthworms for feeding, nearby fields or small forest openings for courtship and roost site (DeGraaf et. al., 1991) and is largely absent from extensive areas of mature forest (Palmer-Ball, 1996). The presences of edge habitat and a high shrub stem density may be important for nest site selection in some areas (NatureServe, 2001). Appears to be partial to sheltered wet thickets along meandering streams (Barbour et. al., 1973). American woodcocks would be attracted to the marshy backwater areas of rivers and larger streams, especially where a dense cover of shrubs, grasses and vines is present.

Ovenbird – *Seiurus aurocapillus* – Mature and second growth forest conditions are utilized, on dry to moderately moist sites with light to moderate understory. Birds are more common in stands with closed canopies and open ground—This is a ground nesting species that forages in the leaf litter or on the soil. Mengel observed nests on logging

roads and under small logs, sheltered by ferns, on steep, mesophytic slopes (1965); however, Baker and Lacki note that birds are more abundant in non-harvested than in harvested areas (1997). Upland stands and sloping terrain are preferred, but a variety of deciduous and mixed (e.g., pine-oak) forest types are used. This is a forest interior species having a minimum necessary tract size of 15 ha (Hamel 1992). The ovenbird is commonly found on the steep slope adjacent to rivers and streams.

Louisiana Waterthrush – *Seiurus motacilla* – This forest interior breeding bird frequents rather steep, wooded slopes in riparian areas: especially the banks of rocky, rushing streams. Nests are usually near the water--commonly in crevices at the base of rocks under bank overhangs in heavily shaded areas (Mengel 1965). On the DBNF, the birds are nearly always found where a dense understory of rhododendron or other shrubs shades the stream (L. Perry, pers. obs.). Hamel gives the minimum tract size necessary for the species as 875 ha (1992). The Louisiana waterthrush would utilize the edges of small streams for nesting and foraging habitat.

Yellow-throated Vireo – *Vireo flavifrons* – Extensive tracts of relatively mature woodland are necessary for this interior breeding bird. Large, deciduous trees within a variety of forest types, including mixed mesophytic cove, pine-oak, and oak hickory upland forest, are favored. Isolated or much-dissected tracts are avoided; however, the bird will tolerate a certain amount of disturbance (from fire, selective logging) without being dramatically affected (Palmer-Ball, 1996). Rather, activities that serve to result in a fairly open midstory/understory can be beneficial, as the birds frequent trees within relatively open settings. Yellow-throated vireos on the DBNF are often observed in hardwoods within mixed pine-hardwood stands that have been burned or had midstory reduction (L.Perry, pers. obs.). The yellow-throated vireo would be expected to be attracted to the hardwood-dominated areas along streams and river floodplains.

Mammals

Beaver – *Castor canadensis* – is a year-round resident of the river floodplain forest habitat association on the DBNF. They are closely associated with water, normally ranging within about 500 feet of 2nd to 4th order streams. Another important element in beaver habitat is the availability of food, usually fairly young, tender tree species associated with the riparian zones. Young seral stage tree vegetation within 500 feet of creeks and rivers provides an abundant food source. Activities that favor young deciduous growth, such as timber harvest or to some extent prescribed fire, will usually benefit beavers. The diet of the beaver changes throughout the year. From fall to spring beavers rely mainly on woody vegetation although they will use this food throughout the year. During the summer beavers eat a variety of foods including; pondweeds, duckweeds, pond lilies, algae and fleshy rootstocks of many other species, as well as a wide variety of upland or riparian herbaceous plants. Beavers alter stream habitats by their dam construction and create other unique habitats for both terrestrial and aquatic species. Lotic streams are altered to become more lentic systems. Beaver dams provide a shifting mosaic of environmental conditions within stream corridors. Additionally, beavers add much needed large woody debris to stream systems thereby aiding many aquatic organisms which require this habitat component.

River Otter – *Lutra (Lontra) canadensis* – Once thought to be extirpated from the DBNF, river otters have recently been reintroduced to selected areas on the forest. River otters are now established in a few locations within the river floodplain habitat association. As their name would imply, this species is closely associated with stream habitat. A forested riparian corridor is essential to maintaining good river otter habitat. River otter food habits include about 50% fish with the remainder made up of frogs, crayfish, insects and various other animals including small birds and mammals. Home ranges are linear along stream courses and may be many miles long. Den sites that may also be used for rearing young are near water and may be hollow logs, abandoned beaver lodges, the burrow of another animal or spaces under root wads or rocky overhangs.

Southeastern Myotis – *Myotis austroriparius* – The Southeastern myotis rarely occurs on the DBNF which is considered to be on the very edge of the species range. This species utilizes limestone caves for hibernation and is difficult to detect because of its habit of wedging itself far back in cracks and crevices in the ceilings and walls of caves. The Southeastern myotis roosts almost exclusively in caves during the winter and some cave use occurs in the summer. These bats also use hollow trees as summer and maternity roosts. Foraging areas are usually over riparian habitat bordering streams, lakes and ponds. Aquatic insects such as small beetles, moths and mosquitoes form the basis of the food species for the Southeastern myotis.

Gray Bat – *Myotis grisescens* – No large hibernating, bachelor or maternity colonies of gray bats are currently known to exist on the DBNF. Gray bats have been observed in small numbers in caves and in riparian forest areas at several locations on the forest. Gray bats roost in limestone caves year-round, but seasonally they may utilize different caves during the summer and winter. They may migrate between caves or sometimes can be considered as residents of a relatively small area. Gray bats feed almost exclusively over water in riparian forest areas. Emerging aquatic insects such as beetles, moths, mayflies, stoneflies and caddisflies make up the bulk of their diet.

Eastern Small-footed Bat – *Myotis leibii* – The eastern small-footed bat likely occurs in forested areas throughout the DBNF. Foraging habitat is often associated with riparian areas, but may occur elsewhere in the forest or forest edge. Summer roosting habitat includes caves, under rocks, bridges (in expansion joints), hollow trees and under exfoliating bark. Food habits are thought to be almost exclusively flying insects associated with riparian habitats. Reproducing females have been found in Eastern Kentucky, but the species is believed to be most common on the DBNF during the winter. Winter hibernation often occurs in relatively cold areas of low humidity just within the entrance of caves or mines. Thus, the eastern small-footed bat may be vulnerable to freezing in severe winters and to human disturbance. The species also hibernates in rock shelters and in fissures within cliff lines.

Indiana Bat – *Myotis sodalis* – The DBNF is known to support both winter and summer colonies of the Indiana bat. During the non-hibernation season Indiana bats are likely to occur throughout the DBNF. Some males periodically roost in caves during the summer,

but most, along with females, roost under exfoliating bark or in hollow cavities in a variety of dead and alive trees. Roost trees with some sun exposure seem to be preferred because they are warmer. Indiana bats forage for insects in a wide variety of forest habitats ranging from riparian corridors to upland oak to higher elevation ridgetops. Forest canopy ranges from relatively closed to fairly open and Indiana bats sometimes forage in and near grass areas at the forest edge. An open forest understory enhances the bats ability to navigate within the forest stands. Available water in the form of shallow waterholes or ponds enhances general habitat suitability and utilization. Maternity populations are known to exist on the DBNF. Female Indiana bats are known to use multiple roost trees during the lactation period and may forage and roost up to 2 ½ miles from their primary roost trees. During the winter Indiana bats hibernate in several cool/cold limestone caves on the DBNF. These bats gather in large clusters on cave ceiling and need protection from human disturbance during this time of year. Significant hibernation caves occur on the Stanton, London and Somerset Ranger Districts. Hibernation caves are most often, but not always, associated with limestone cliff lines. Maintaining forest canopy around hibernation caves helps maintain microclimate conditions and provides nearby roosting and foraging habitat, particularly during the fall swarming season.

Reptiles

Northern Coal Skink – *Eumeces anthracinus anthracinus* – The Appalachian population of this subspecies extends into eastern KY, while a disjunct population occurs in the west-central part of the State. Suitable habitat includes damp forests of oak, oak-poplar, oak-hickory-pine, and mixed pine-hardwood with moist soils, abundant leaf litter, logs, and/or loose stones; humid wooded or rocky hillsides; rocky bluffs; and similar areas near water sources, such as streams, springs, swamps, and bogs. These skinks seek the cover of rocks, logs, stumps, brush, and rock slabs. When pursued, they will take refuge in shallow water, hiding under rocks at the bottom. Various rocky areas in which they have been found include: on limestone ledges; in dry leaves beneath rock ledges; beneath flat slabs of sandstone; under rocks in sunlit forest openings and in grassy cut over areas in hardwoods; and under rocks in the slope of a road cut through a mixed forest (VA Dept. of Game and Inland Fisheries 2001). Use of fire to maintain grassy openings within forested stands is of benefit to this species. Coal Skinks feed primarily on insects and spiders.

Eastern Ribbon Snake – *Thamnophis sauritus sauritus* – This is a semiaquatic species almost always found close to the shallow water of bogs, marshes, swamps, ponds, streams, and weedy lake shorelines. Other low, wet places in which it is encountered include meadows and grassy roadside ditches. Occupied areas tend to be open, but with an abundance of ground cover, such as grasses and sedges, and bushes in which the snakes can sun themselves. These snakes often climb into low vegetation, although rarely more than 4 feet off the ground (Barbour 1971). When startled, they swim on the surface of the water. Deep water is normally avoided, and fleeing Ribbon Snakes skirt the shore, threading their way through vegetation and getting lost from sight with amazing rapidity (Conant and Collins 1991). Their diet consists of small fish and amphibians.

PLANTS

Dicots

Running Serviceberry – *Amelanchier stolonifera* – is montaine Appalachian species that is found in rocky and sandy soil in dry, open hardwood forest. The only Kentucky record is from the DBNF area. It is located on rocky soils on a limestone ridge in dry open oak-cedar forest.

Rockcastle Aster – *Aster saxicastellii* – inhabits open cobble/boulder bars along free-flowing rivers. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition.

Spreading False Foxglove – *Aureolaria patula* – is a calciphile and occurs in association with limestone. On the DBNF, it occurs in rocky mixed oak-hardwood forest, usually in areas with an open canopy and a sparse midstory. It also occurs in tree gaps. Soils are usually thin. Most of the DBNF sites are on slopes above larger streams or rivers.

False Indigo – *Baptisia australis* var. *australis* – is prairie and Appalachian provinces species. It grows in open warm season grassland or in open forest (usually yellow pine or yellow pine-oak) with a sparse midstory and a grass-forb ground layer. On the DBNF and in Kentucky, the species is only known from riverine cobble/boulder bars. A prairie-like flora, which includes warm season grass species, develops on these bars. Frequent scouring by high water and flood events keeps most trees and shrubs off of the bars and maintains them in an open condition.

Brook Saxifrage – *Boykinia acontifolia* – is found throughout its range associated with stream banks. It grows on continually wet, sandy or rocky banks just above summer water levels. It is usually found in moderate shade.

Sweetshrub – *Calycanthus floridanus* (generic) – occurs as var. *glaucus* on the DBNF. Species-habitat relationships are described for that that variety below.

Sweetshrub or Carolina Allspice – *Calycanthus floridus* var. *glaucus* – is a southern species found in a variety of habitats, but usually along waterways. It often grows in large colonies. On the DBNF is found on stream terraces which are well-drained and seldom subject to flooding. The overstory is usually open and composed of mixed oak-hardwoods, sometimes with southern yellow pine. One site occurs on the upper portions of a toe slope in oak forest.

Prairie Redroot – *Ceanothus herbaceous* – is a midwestern species associated with rocky soils in grasslands and along streams. The Kentucky records occur in the DBNF area, where it occurs only on boulder and cobble bars associated with larger streams. The habitat is open and is maintained open by periodic scouring during flood events.

American Golden-saxifrage – *Chrysoplenium americanum* – is a northern species found on mud or moist soil at the edge of seasonal ponds and stream banks, or wet sandstone

cliffs. It occurs singly or as small clumps of plants. On the DBNF, it is known from a few locations, all from stream banks or sandstone cliffs. The plant requires moist conditions and is usually in the shade of other vegetation.

Throughout most of its range, sweet fern – *Comptonia peregrina* – is associated with open, sterile, sandy ground where it forms dense, low thickets. In this habitat, fires probably helped maintain the habitat. On the DBNF, this species inhabits open cobble/boulder bars along free-flowing rivers. The plants are found rooted deep in the crevices between boulders. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition.

Cumberland Rosemary – *Conradina verticillata* – inhabits open cobble/boulder bars along free-flowing rivers. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition. Scouring also helps to spread pieces of the shrub, which when broken and carried downstream to suitable habitat, often root and establish new populations. Currently, this species does not occur on the DBNF, but habitat for the species may occur on some streams within the Cumberland River drainage.

Goldenseal – *Hydrastis Canadensis* – grows in a variety of habitats ranging from well-drained floodplain to mesic cove forest. On the DBNF, it is known from floodplain sites, mixed mesophytic forest, and drier hardwood forest on limestone. It usually occurs in clusters of not more than a few dozen plants, but a few sites have been found with 1000s of plants. The species is a moderate calciphile and does best in well drained soils with ample available moisture. Shade is usually moderate, and the largest colonies have little or no midstory.

American Water-pennywort – *Hydrocotyle Americana* – is a northern species that extends south along the Appalachian Mountains. It grows on usually damp sandy soil, often along streams. On the DBNF, it occurs in only one area, on the sandy floodplain of a stream. The overstory is oak-yellow pine and the midstory is sparse.

Butternut or White Walnut – *Juglans cinerea* – is distributed from southern Ontario to the southern Appalachians. In the northern portions of the range, the species is usually found on well-drained floodplains, either in open areas or as part of a forest canopy. To the south, the species also occurs in rich, mesic hollows. As young trees, they are intolerant, require high light. On the DBNF, it is found in both habitat types, but most trees are infected with butternut canker.

Vetchling Peavine – *Lathyrus palustris* – is found on the coastal plain and in the mountains of eastern North America. It is typically found in or at the edge of floodplain forest, swamps, wet meadows or streamside fields, and riverbanks. On the DBNF, this species occurs on terrace forest of larger streams.

Smooth Veiny Peavine – *Lathyrus venosus* – is widespread in eastern North America. It is often found in open dry forest, but may also be found in moist mesic or terrace forest,

and sometimes on stream banks. On the DBNF, it is found in dry-mesic oak and mixed mesophytic forest, often near gaps or other areas of higher light levels.

Short's bladderpod – *Lesquerella globosa* – is found on limestone or calcareous glades, talus slopes in open woods, or rock cuts. The species requires open conditions, including bare soil. It is not known from the DBNF, but is present nearby. Habitat for the species occurs on the forest along the western edge of ownership.

Nuttall's Lobelia – *Lobelia nuttallii* – is a coastal plain species with stations inland along the southern Appalachian Plateaus. The species is found in open sandy swamps, wet yellow pine savannas, and wetlands. On the DBNF, it is known from wet meadows and wet warm season grassland.

Marshallia grandiflora – This species inhabits open cobble/boulder bars along free-flowing rivers. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition. Currently this species is not known from the DBNF, but habitat for it may exist on some streams within the Cumberland River drainage.

Carolina Anglepod – *Matelea carolinensis* – is a coastal plain species with range extensions along the southern Appalachian Plateaus. It grows in moist, open forest, either yellow pine or hardwood, and in sandy old fields and waste areas. On the DBNF, the single station is on a sandy roadside adjacent to open yellow pine-oak forest.

Mock Orange – *Philadelphus inodorus* var. *grandiflorus* (per Medley, 1993) – is an Appalachian provinces species. It is found along stream banks, on moist soil in open forest, and on cliffs. On the DBNF, the species is found on limestone cliffs and glades.

Hoary Mock Orange – *Philadelphus pubescens* var. *pubescens* – is a southern Appalachian and Ozarkian species. Medley (1993) rejects this species for the forest area, suggesting *P. pubescens* var. *intectus* as more likely. Even this variety is uncertain for the DBNF area. The DBNF area record (Pulaski County) is an uncertain identification. If present, the species occurs on limestone cliffs and glades.

Nodding Rattlesnake-root – *Prenanthes crepidinea* – is northern midwest species with disjunct populations to the south. It is found in moist, usually floodplain forest. On the DBNF, all locations are from open, mesic, terrace forest, mixed mesophytic forest, or the transition between them. The plants flower best in open conditions such as forest edge, but occur as vegetative plants in heavier shade.

Rock Scullcap – *Scutellaria saxatilis* – is an Appalachian Mountains species. Its habitat is forested hillside, moist cliffs, and low forest. On the DBNF, it is found in rocky, mesic forest, usually over sandstone.

Short-stem Ragwort – *Senecio pauperculus* – is northern US and Canada species with range extensions southward along the Appalachian provinces. It is commonly found in bogs and wet meadows. On the DBNF, the species is found on boulder/cobble bars of

Cumberland River drainage streams. In this habitat, moisture levels may be maintained, and habitat it maintained in an open condition.

Southern Oconee Bells – *Shortia galacifolia* var. *galacifolia* – is narrow endemic of the southern Appalachian Mountains. It grows in rich woods on stream banks. The only Kentucky record, an introduction in to the Red River Gorge Geological Area (DBNF) is maintaining itself in similar habitat.

Riverbar Goldenrod – *Solidago spathulata* (as spp. *randii* var. *racemosa* per Cronquist 1980; as *S. simplex* ssp. *randi*, two vars. per Medley 1993) – is found on boulder and cobble bars along large streams and rivers. In Kentucky, the taxon is present only in the DBNF area where it is found on sandstone boulder/cobble bars along larger streams and rivers of the Cumberland River drainage.

Virginia Spiraea – *Spiraea virginiana* – inhabits two habitat types within riparian areas. On the Daniel Boone NF, the species occurs on both cobble/boulder bars and on streambanks. These habitats are generally open with limited overstory. In both cases, the actual areas inhabited are subject to scouring (or were prior to dam construction) during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition. Scouring also helps to spread pieces of the shrub, which when broken and carried downstream to suitable habitat, often root and establish new populations.

Big-flowered Snowbell – *Styrax grandiflorus* – is southern Appalachian Mountains and southeastern coastal plain species. It commonly grows in mixed or deciduous forest in upland locations. There is at least one reliable record for the species in Kentucky from the DBNF area (McCreary County). Here is growing in mixed mesophytic forest on a north aspect above the Cumberland River.

Synandra – *Synandra hispidula* – is more or less distributed along the Ohio River basin and the eastern Cumberland and Tennessee River basins. It is generally found in rich woods, often on limestone or on base rich soils. On the DBNF, most sites are on limestone along intermittent, upland streams, rich lower slopes in mixed mesophytic woods, or on rarely flooded stream terraces in mesophytic forest.

Spiked Hoary-pea – *Tephrosia spicata* – is a southern species with a number of more northern stations. It is commonly found in dry to wet, open yellow pine or yellow pine-hardwood forest, roadsides, clearings and fields. On the DBNF, the species is found on boulder/cobble bars along larger streams and rivers of the Cumberland River drainage. A few sites are known from sandy, sparsely shaded openings on ridges.

Slippery Elm – *Ulmus rubra* – is widespread in eastern and central North America. It is found typically in moist woods such as floodplain forest. On the DBNF, the species is commonly found in floodplain forest, at forest edge along roadsides, and often in mesic hardwood forest on limestone or base rich soils.

New York Ironweed – *Vernonia noveboracensis* – is a coastal plain species with scattered interior stations. It is found in open floodplain forest, roadside ditches, marshes,

and other wet places. On the DBNF, the species is found in streamhead wetlands and occasionally in roadside ditches. A canopy may be present, but if so, the midstory and shrub layers are sparse.

Sand Grape – *Vitis rupestris* – is found along the Appalachian and Ozarkian Mountains. It occurs along rivers in boulder and cobble bars. The more western populations are often on limestone bedrock and occur on streams which infrequently flood. The more eastern populations, including those on the DBNF, are often on sandstone along rivers, which flood and scour any time of year. The scouring keeps most woody vegetation from establishing on the bars and maintains the sites in open condition.

Toothache-tree – *Zanthoxylum Americana* – is found in much of northern North America south to the Gulf coastal plain. It grows in moist forest and forest edges. On the DBNF, it is infrequent but locally abundant on limestone outcrops in open dry-mesic forest or along roadsides.

Liverworts

Liverwort – *Jubula pensylvanica* – is found throughout eastern North America. It grows in clean, low flow water where it is attached to sandstone rocks and cobble. These sites are in heavy shade. It grows in similar sites on DBNF as well as on saturated sand in sandstone rockshelters.

This liverwort – *Tricocholea tomentella* – occurs on streambanks. On the DBNF, it is found on moist, sandy flats along streams, just above summer water levels. The sites are on low gradient sections of streams in moderate to heavy shade, often under a canopy of hemlock, magnolia and rhododendron. This species is not tolerant of heavy deposition, so stable stream dynamics are essential for its health.

Gymnosperms

Pitch Pine -- *Pinus rigida* – ranges from New England to the Appalachian Mountains. It grows in generally sterile, sandy soil where it competes well against many other woody species. These soils are usually dry, but may be moist. The cones are semi-serotinous, opening following hot fires or occasionally very hot days. Fire also prepares a seedbed advantageous to the light seeds. On the Daniel Boone NF, this species is most commonly found within a few hundred feet of sandstone cliffs. The soils here are sandy, thin and usually dry providing the conditions under which the species competes. These areas also would have been subject to periodic burning, aiding regeneration of the species.

Northern White Cedar – *Thuja occidentalis* – has a northeastern North American distribution with range extensions southward along the Appalachian provinces and other westerly disjunct stations. In its primary range, the species occurs in moist to damp soil, or swamps where it can form dense monotypic forests. On the DBNF, the species is found on limestone cliffs and talus slopes along the Cumberland River and some of its major tributaries. In most case, the plants are associated with karst seeps on the cliffs. One location is on a sandstone boulder in a creek.

Monocots

Caric Sedge – *Carex seorsa* – is a wet forest species with a range over much of the eastern US. It grows in areas that remain wet throughout the year. On the DBNF, it is associated with a few streamhead wetlands and slope seeps. It grows in clumps forming thick to thin mats of vegetation. Shade is usually moderate to light.

Kentucky Lady's-slipper – *Cypripedium kentuckiense* – occurs along streambanks and in river front or floodplain forest. It occurs on DBNF streambanks where silty sand accumulates. These areas are low, usually not more than 6 cm (4 in) above summer water level. Most are open or lightly shaded. The river front and floodplain forest sites are well drained and usually moderately shady. Flowering appears to be best in more open areas. All three habitats are subject to flooding events throughout the year. Flooding may help control competition and helps to maintain fertility on the sites.

Loesel's Twayblade – *Liparis loeselii* – is a northern and midwestern North American species. It is found in wet to damp forest. On the DBNF, it is known from wet seeps on roadsides, a seep at the base of an abandoned limestone quarry, and at the edge of a strip mine pond.

Clubspur Orchid – *Platanthera clavellata* – occurs in a wide variety of habitats across its range. On the DBNF, it occurs in streamhead wetlands, in seeps, on streambanks, and in swamps. It is usually found in mucky soil under moderate to heavy shade. The soil in which it occurs is always damp or wet. This species is an alternative host to the endophyte fungus that is the sole fungal associate for white fringeless orchid (*P. integrilabia*). Maintaining this orchid helps to maintain a diverse stock for the fungal symbiont.

White Fringeless Orchid -- *Platanthera integrilabia* – On the Daniel Boone NF, this species is found in streamhead seeps, or rarely streambanks in the vicinity of streamhead wetlands. This species requires the sterile, constantly wet to moist sandy soil found in this habitat. Water in these seeps is always flowing at least below the surface, and is never stagnant. It is possible that this helps keep the species endophyte fungus associate from damaging the plant. The species almost always grows in mats of *Sphagnum* mosses, but occasionally is associated with leaf litter or a thin layer of organic muck. It is probable *Sphagnum* helps to maintain moisture and soil pH. It is also known to serve as a nursery for seed germination. The canopy associated with these seeps ranges from open to closed. The open conditions encourage butterfly-attracting species such as *Eupatorium fistulosum*, which in turn increase the chances of pollination of the orchid flowers. The closed canopy condition may improve germination and establishment of seedlings.

Small Purple-fringed Orchid – *Platanthera psycodes* – is a northern species with a range extension south along the Appalachian Mountains. It is found in wet meadows and wet, open forest. On the DBNF, there are tentative records for this species from wet stream terraces under high canopy closed forest. The identity of the plants in question is not certain.

Shining Ladies'-tresses – *Spiranthes lucida* – is a northeastern to central US species. It is commonly found in damp forest and marshes, and on wet shores. On the DBNF, the species at all sites is found on open limestone streambanks, often in thin mud.

Yellow-eyed Grass – *Xyris torta* – is a coastal plain and lake state species found in bogs and wet, sandy soil of open yellow pine forest and grasslands. The DBNF records are from streamhead wetlands, slope seeps, and wet warm season grasslands and meadows.

Mosses

Sword Moss – *Bryoxiphium norvegicum* – is a northern species that extends southward through the Appalachian Mountains. It is found on wet to damp sandstone and conglomerate in areas of constant high humidity. On the DBNF it occurs on overhangs and on the ceilings of rockhouses along cliffs where shade is high. It also occurs on boulder overhangs near streams.

Closter's Water Hypnum – *Hygrohypnum closteri* – is an Appalachian species with possible stations in Washington state. The species grows in low flow streams attached to rocks. In Kentucky, the only records are from the Red River Gorge Geological Area (DBNF). Here the species was found in streams, one on limestone, one on sandstone.

Moss – *Mnium hornum* – is found on streambanks and in sandstone or conglomerate rockhouses. On the DBNF, the most common habitat is on sandy streambanks along low gradient sections of streams. These areas are usually under a canopy of hemlock, magnolia and rhododendron. While it may occur with *Tricocholea tomentella*, it appears more tolerant of deposition.

Moss – *Syrrhopodon texanus* – is a coastal plains species with disjunct distribution in the Appalachian and Ozarkian provinces. It commonly occurs on moist rotten logs and stumps, on rock and the bark of trees, especially in low ground. On the DBNF, the species is almost always encountered on the back walls of moist, shaded sandstone or conglomerate rockhouses or cliff faces.

References:

- Barbour R.W. 1971. Amphibians and reptiles of Kentucky. The University Press of Kentucky, Lexington, KY.
- Behler, J.L. and F.W. King. 1979. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York.
- Bellrose, F.C. 1980. Ducks, Geese, and Swans of North America. Wildlife Mangement Institute. Stackpole Books, Harrisburg, P.A. 540 pp.
- Buehler, D.A., and C.P. Nicholson. 1997. Ecology of the Cerulean Warbler in the Cumberland Mountains and the Southern Appalachians. 1996 Annual Report. Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.

- Conant, R. and J.T. Collins. 1991. Peterson field guide to reptiles and amphibians: eastern and central North America. 3rd ed. Houghton Mifflin, Boston.
- DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and Rangeland Birds of the United States - Natural History and Habitat Use. USDA Agriculture Handbook 688. 625 pp.
- Hamel, Paul B. 1992. Land Manager's Guide to Birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Medley, M.E. 1993. An annotated catalog of the known or reported vascular flora of Kentucky. Unpublished dissertation. University of Louisville. [A reset, reduced type copy from TNC/KSNPC].
- Mengel, R.M. 1965. The Birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581pp.
- Morehead Inventory
- NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Association for Biodiversity Information, Arlington, VA. Available: <http://www.natureserve.org/>. (Accessed: July 25, 2001).
- Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky, Lexington, KY. 372pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.
- Storm Damage DEIS
- VA Dept of Game and Inland Fisheries: VA Fish and Wildlife Information Service. 2001. Available: <http://www.dgif.state.va.us/>. (Accessed July 26, 2001).
- Wilson, L.A. 1995. Land manager's guide to the amphibians and reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and The U.S. Forest Service, Southern Region, Atlanta, GA.

07/15/2003

Attachment C.

Riparian Habitat Association Matrix

Assoc.	Habitats	Modifier	Class	Common/Species
10-Riparian	Boulder (Scour) Bars	Acidic Substrate	P-DIC	Prairie Redroot/ Ceanothus herbaceus
		Drainage Good		Cumberland Rosemary/ Conradina verticillata
				Prairie Redroot/ Ceanothus herbaceus
		Open (Little or No Shade)		Cumberland Rosemary/ Conradina verticillata
				False Indigo/ Baptisia australis var. australis
				Riverbar Goldenrod/ Solidago spathulata
				Spiked Hoary-pea/ Tephrosia spicata
				Sweet-fern/ Comptonia peregrina
				Virginia Spiraea/ Spiraea virginiana
		Open Forest Canopy		Rockcastle Aster/ Aster saxicastellii
		Sandy Soil		Cumberland Rosemary/ Conradina verticillata
				Rockcastle Aster/ Aster saxicastellii
		Scoured, at least occasionally		Cumberland Rosemary/ Conradina verticillata
				Rockcastle Aster/ Aster saxicastellii
		Shrub/Sapling Condition		Rockcastle Aster/ Aster saxicastellii
	Cane Breaks	(none)	BIRD	Eastern Towhee/ Pipilo erythrophthalmus
		Dense shrub understory		Swainson's Warbler/ Limnothlypis swainsonii
	Eastern River Front Forest	(none)		Hooded Warbler/ Wilsonia citrina
				Kentucky warbler/ Oporornis formosus
				Wood Thrush/ Hylocichla mustelina
		Forest Interior (Minimal Edge)		Prothonotary warbler/ Protonotaria citrea
		Mature forest		Kentucky warbler/ Oporornis formosus
				Wood Thrush/ Hylocichla mustelina
		Moderate Shade		Wood Thrush/ Hylocichla mustelina
		Moist		Hooded Warbler/ Wilsonia citrina
				Kentucky warbler/ Oporornis formosus
				Wood Thrush/ Hylocichla mustelina
		Riparian		Wood Duck/ Aix sponsa
			MAMM	Eastern Small-footed Bat/ Myotis leibii
			P-DIC	Vetchling Peavine/ Lathyrus palustris
		Snags > 6" dbh	BIRD	Prothonotary warbler/ Protonotaria citrea
				Wood Duck/ Aix sponsa
		Tract Size (Area Sensitive)		Prothonotary warbler/ Protonotaria citrea
		Tree and Snags (Cavity Nesters)		Prothonotary warbler/ Protonotaria citrea
				Wood Duck/ Aix sponsa
		Trees > 20" dbh		Bald Eagle/ Haliaeetus leucocephalus
		Water (Distance Sensitive)		Bald Eagle/ Haliaeetus leucocephalus
				Prothonotary warbler/ Protonotaria citrea

07/15/2003

<u>Assoc.</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Wood Duck/ Aix sponsa
	Floodplains/Terraces	(none)		Hooded Merganser/ Lophodytes cucullatus
			P-DIC	Smooth Veiny Peavine/ Lathyrus venosus
		Closed Forest Canopy	BIRD	Acadian flycatcher/ Empidonax virescens
		Downed Logs	P-MOS	Moss/ Syrrhopodon texanus
		Drainage Good	P-DIC	Butternut/ Juglans cinerea
				Goldenseal/ Hydrastis canadensis
			P-GYM	Pitch Pine/ Pinus rigida
		Fire Tolerant/Enhanced		Pitch Pine/ Pinus rigida
		High Shade	P-LIV	Liverwort/ Trichocolea tomentella
		High/Constant Humidity (Microclimate)		Liverwort/ Trichocolea tomentella
		Large Decadent Trees	BIRD	Cerulean Warbler/ Dendroica caerulea
		Low (wet, i.e. subject to holding water)	P-MON	Least Trillium/ Trillium pusillum var. pusillum
		Mature forest	BIRD	Black-and-white Warbler/ Mniotilta varia
				Cerulean Warbler/ Dendroica caerulea
				Hooded Merganser/ Lophodytes cucullatus
		Mid-age Forest		Black-and-white Warbler/ Mniotilta varia
		Moderate Shade	P-DIC	Smooth Veiny Peavine/ Lathyrus venosus
				Vetchling Peavine/ Lathyrus palustris
		Open Forest Canopy	P-MON	Kentucky Lady's Slipper/ Cypripedium kentuckiense
		Open Midstory/Understory	BIRD	Acadian flycatcher/ Empidonax virescens
		Rich Soil	P-DIC	Goldenseal/ Hydrastis canadensis
		Sandy Soil	P-GYM	Pitch Pine/ Pinus rigida
			P-MON	Kentucky Lady's Slipper/ Cypripedium kentuckiense
		Scoured, at least occasionally		Kentucky Lady's Slipper/ Cypripedium kentuckiense
		Sediment free	P-LIV	Liverwort/ Trichocolea tomentella
		Seep/Constant Water		Liverwort/ Trichocolea tomentella
			P-MOS	Moss/ Syrrhopodon texanus
		Slope (hillside, steepness)	BIRD	Black-and-white Warbler/ Mniotilta varia
		Snags > 6" dbh		Wood Duck/ Aix sponsa
		Tract Size (Area Sensitive)		Acadian flycatcher/ Empidonax virescens
		Tree and Snags (Cavity Nesters)		Hooded Merganser/ Lophodytes cucullatus
				Wood Duck/ Aix sponsa
		Trees > 20" dbh		Bald Eagle/ Haliaeetus leucocephalus
		Water (Distance Sensitive)		Bald Eagle/ Haliaeetus leucocephalus
				Hooded Merganser/ Lophodytes cucullatus
				Wood Duck/ Aix sponsa
	River Floodplain Forest	(none)	P-DIC	Nuttall's Lobelia/ Lobelia nuttallii
		Burrows, Holes, Tunnels	MAMM	River Otter/ Lutra (Lontra) canadensis
		Closed Forest Canopy	BIRD	Acadian flycatcher/ Empidonax virescens
		Dense shrub understory		Hooded Warbler/ Wilsonia citrina
				Kentucky warbler/ Oporornis formosus
				Swainson's Warbler/ Limnethlypis swainsonii
		Downed Logs	MAMM	River Otter/ Lutra (Lontra) canadensis

07/15/2003

<u>Assoc.</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
		Exfoliating bark, (trees dead or alive)	MAMM	Indiana Bat/ Myotis sodalis
				Southeastern myotis/ Myotis austroriparius
		Forest Interior (Minimal Edge)	BIRD	Cerulean Warbler/ Dendroica caerulea
				Prothonotary warbler/ Protonotaria citrea
				Swainson's Warbler/ Limnethlypis swainsonii
		Low (wet, i.e. subject to holding water)	P-MON	Caric Sedge/ Carex seorsa
		Mature forest	BIRD	Cerulean Warbler/ Dendroica caerulea
				Kentucky warbler/ Oporornis formosus
		Moist		Hooded Warbler/ Wilsonia citrina
				Kentucky warbler/ Oporornis formosus
		Open Forest Canopy	MAMM	Indiana Bat/ Myotis sodalis
		Open Midstory/Understory	BIRD	Acadian flycatcher/ Empidonax virescens
				Cerulean Warbler/ Dendroica caerulea
		Regeneration area/early seral	MAMM	Beaver/ Castor canadensis
		Riparian	MAMM	Gray Bat/ Myotis grisescens
				Southeastern myotis/ Myotis austroriparius
			P-DIC	Vetchling Peavine/ Lathyrus palustris
		Snags > 6" dbh	BIRD	Prothonotary warbler/ Protonotaria citrea
				Wood Duck/ Aix sponsa
		Tract Size (Area Sensitive)		Acadian flycatcher/ Empidonax virescens
				Cerulean Warbler/ Dendroica caerulea
				Prothonotary warbler/ Protonotaria citrea
				Swainson's Warbler/ Limnethlypis swainsonii
		Tree and Snags (Cavity Nesters)		Prothonotary warbler/ Protonotaria citrea
				Wood Duck/ Aix sponsa
		Trees > 20" dbh		Bald Eagle/ Haliaeetus leucocephalus
				Cerulean Warbler/ Dendroica caerulea
		Water (Distance Sensitive)		Bald Eagle/ Haliaeetus leucocephalus
				Prothonotary warbler/ Protonotaria citrea
				Wood Duck/ Aix sponsa
			MAMM	Beaver/ Castor canadensis
				River Otter/ Lutra (Lontra) canadensis
	Sand/Gravel/Cobble Bars	Open (Little or No Shade)	P-DIC	Riverbar Goldenrod/ Solidago spathulata
			P-MON	Shining Ladies'-tresses/ Spiranthes lucida
		Riparian	P-DIC	Riverbar Goldenrod/ Solidago spathulata
	Stream Banks	(none)	BIRD	Hooded Merganser/ Lophodytes cucullatus
			P-DIC	American Water-pennywort/ Hydrocotyle americana
				Brook Saxifrage/ Boykinia acontifolia
				Carolina Allspice/ Calycanthus floridanus
				Carolina Anglepod/ Matelea carolinensis
				Mock Orange/ Philadelphus inodorus
				Sand Grape/ Vitis rupestris
				Short-stem Ragwort/ Senecio pauperculus
				Smooth Veiny Peavine/ Lathyrus venosus

07/15/2003

<u>Assoc.</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Sweetshrub/ Calycanthus floridus var. glaucus
				Toothache-tree/ Zanthoxylum americana
				Virginia Spiraea/ Spiraea virginiana
			P-MON	White Fringeless Orchid/ Platanthera integrilabia
		Basic Substrate	P-GYM	Northern White Cedar/ Thuja occidentalis
			P-MON	Loesel's Twayblade/ Liparis loeselii
				Shining Ladies'-tresses/ Spiranthes lucida
		Cool Temperatures	P-LIV	Liverwort/ Trichocolea tomentella
		Dense shrub understory	BIRD	Louisiana Waterthrush/ Seiurus motacilla
				Swainson's Warbler/ Limnothlypis swainsonii
		Forest Interior (Minimal Edge)		Louisiana Waterthrush/ Seiurus motacilla
				Swainson's Warbler/ Limnothlypis swainsonii
		High Shade		Louisiana Waterthrush/ Seiurus motacilla
				Swainson's Warbler/ Limnothlypis swainsonii
			INSEC	Cliff Caddisfly/ Manophylax butleri
			P-DIC	American Golden-saxifrage/ Chrysopenium americanum
				Brook Saxifrage/ Boykinia acontifolia
				Smooth Veiny Peavine/ Lathyrus venosus
				Southern Oconee bells/ Shortia galacifolia var. galacifolia
			P-LIV	Liverwort/ Trichocolea tomentella
			P-MON	Clubspur Orchid/ Platanthera clavellata
			P-MOS	Sword Moss/ Bryoxiphium norvegicum
		Moderate Shade	P-DIC	American Golden-saxifrage/ Chrysopenium americanum
				Goldenseal/ Hydrastis canadensis
				Rock Sculcap/ Scutellaria saxatilis
				Smooth Veiny Peavine/ Lathyrus venosus
				Spreading False Foxglove/ Aureolaria patula
				Vetchling Peavine/ Lathyrus palustris
			P-MON	Small Purple-fringed Orchid/ Platanthera psycodes
		Moist	BIRD	Swainson's Warbler/ Limnothlypis swainsonii
			INSEC	Cliff Caddisfly/ Manophylax butleri
			P-DIC	American Water-pennywort/ Hydrocotyle americana
				Barbara's Buttons/ Marshallia grandiflora
				New York Ironweed/ Vernonia noveboracensis
				Rock Sculcap/ Scutellaria saxatilis
				Synandra/ Synandra hispidula
				Virginia Spiraea/ Spiraea virginiana
			P-MON	Shining Ladies'-tresses/ Spiranthes lucida
				Yellow-eyed Grass/ Xyris tortula
		Open (Little or No Shade)	P-DIC	Virginia Spiraea/ Spiraea virginiana
			P-MON	Shining Ladies'-tresses/ Spiranthes lucida
		Remote Habitat	P-DIC	Virginia Spiraea/ Spiraea virginiana
		Rich Soil		Nodding Rattlesnake-root/ Prenanthes crepidinea
				Slippery Elm/ Ulmus rubra
				Southern Oconee bells/ Shortia galacifolia var. galacifolia

07/15/2003

<u>Assoc.</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
		Riparian	BIRD	Louisiana Waterthrush/ Seiurus motacilla
		Rocky/Rocks		Louisiana Waterthrush/ Seiurus motacilla
			P-DIC	Barbara's Buttons/ Marshallia grandiflora
				Hoary Mock Orange/ Philadelphus pubescens var. pubescens
				Lesquereux's Bladder-pod/ Lesquerella globosa
				Running Serviceberry/ Amelanchier stolonifera
				Slippery Elm/ Ulmus rubra
				Virginia Spiraea/ Spiraea virginiana
			P-GYM	Northern White Cedar/ Thuja occidentalis
			P-MON	Small Purple-fringed Orchid/ Platanthera psycodes
			P-MOS	Sword Moss/ Bryoxiphium norvegicum
		Sandy Soil	P-DIC	Barbara's Buttons/ Marshallia grandiflora
				Big-flowered Snowbell/ Styrax grandiflorus
				Sand Grape/ Vitis rupestris
			P-LIV	Liverwort/ Trichocolea tomentella
			P-MON	Loesel's Twayblade/ Liparis loeselii
		Scoured, at least occasionally	P-DIC	Virginia Spiraea/ Spiraea virginiana
		Seep/Constant Water		American Water-pennywort/ Hydrocotyle americana
			P-LIV	Liverwort/ Jubula pensylvanica
			P-MON	Clubspur Orchid/ Platanthera clavellata
				Small Purple-fringed Orchid/ Platanthera psycodes
			P-MOS	Closter's Water Hypnum/ Hygrohypnum closteri
		Slope (hillside, steepness)	BIRD	Louisiana Waterthrush/ Seiurus motacilla
		Snags > 6" dbh		Wood Duck/ Aix sponsa
		Tract Size (Area Sensitive)		Louisiana Waterthrush/ Seiurus motacilla
				Swainson's Warbler/ Limnodynastes swainsonii
		Tree and Snags (Cavity Nesters)		Hooded Merganser/ Lophodytes cucullatus
				Wood Duck/ Aix sponsa
		Water (Distance Sensitive)		Hooded Merganser/ Lophodytes cucullatus
				Louisiana Waterthrush/ Seiurus motacilla
				Pied-billed Grebe/ Podilymbus podiceps
				Wood Duck/ Aix sponsa
			INSEC	Cliff Caddisfly/ Manophylax butleri

Viability Assessment Report For Grassland Habitat Association

Prepared by
David D. Taylor
Daniel Boone National Forest

I. Description of Habitat Association

Nine distinct habitat types are included in this association. They may occur on almost any part of the landscape although typically are found on upland sites. The presence of graminoid vegetation, such as grasses, rushes and sedges, found in these habitats, ties together this association. Most of the habitats were produced through the direct influence of cultural practices, but a few may occur as natural habitats. The habitats most likely to occur naturally are Warm Season Grassland, and Meadows. The other habitats in this association are Old Field, Wet Field, Cool Season Grassland, Pasture, Cropland, Fescue-Sericea Grassland, and Ruderal/Waste Areas. Each of the nine habitats will be addressed individually. In addition, Canebrake, a naturally occurring grassland type, which usually occurs in a riparian setting on floodplains or terraces, is described under the Riparian Habitat Association.

A. Warm Season Grassland

Warm season grassland is characterized by grass species that flower in late summer to early fall. These are species characteristic of prairies. Prairies are not currently known from the Daniel Boone National Forest (DBNF), but patches of open areas characterized by these species are. These areas may be natural, or more commonly, associated with wildlife openings or utility rights-of-way. They are distributed across the Cliff portion of the Forest, but are rare elsewhere on the Forest. This habitat type occurs in every forest landtype association (LTA) within the Central Escarpment and Southwestern Escarpment Subsections (see USDA Forest Service, 1997; 1996). Most of these areas are on ridges and upper slopes, but may occur on lower slopes and terraces. Bedrock under warm season grasslands is usually sandstone or limestone, but may also be shale, siltstone or mudstone. Soils are usually well drained and sandy, but these grasslands also occur on clayey soils. Water at these sites is many from surface sources (rainfall). On some sites, limited amounts of water help maintain the sites. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the grasslands, also provide energy sources.

Warm season grasses dominate the vegetation of these grasslands. The most common species are Indian grass, little bluestem and big bluestem. Purpletop, switchgrass, side-oats grama, and a variety of panic grasses may also be present. Common forbs include aster and goldenrod species, sunflowers, native flax, cinquefoils, upland buttonweed, and American feverfew. Woody species such as lowbush blueberry, poison ivy, and stunted seedlings of oaks, hickories, and yellow pines are sometimes present.

B. Meadows

As defined here, meadows are moist, cool season grasslands dominated by native species. Meadows are rare on the DBNF and are found only in a few locations along the Cliff section of the Forest. These are generally high elevation habitats, but occasionally occur at lower elevations, as on the Forest. On the DBNF, they occur associated with terraces along larger streams. Underlying bedrock is sandstone, shale, siltstone, or limestone depending on location. Soils are somewhat well drained, usually sandy loams. Water is primarily from surface (rainwater) sources, but may be supplemented by seeps. The habitat tends to stay moist, but does dry out. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the grasslands, also provide energy sources.

Meadow vegetation consists primarily of caric sedges, rushes and grasses such as wedge grass, redtop, and panic grasses. Forbs present may include, small-flowered agrimony, Canada lily, joe pye-weed, mist flower, blue lobelia, and cinquefoils. Weeds, such as sweet vernal grass and stoloniferous redtop are often common components in degraded meadows. Mesic tree species such as white ash, black walnut, butternut, and maples may take hold in these sites.

C. Old Fields

Old fields range from grassy to brushy conditions, but in general have forbs or shrubs about as abundant as graminoid species. They occur throughout the Forest, on all ranger districts and in all DBNF LTAs. Some are maintained as old fields and others are grassy fields that have not been maintained. Some represent a successional stage in the change from an old pasture or crop field to forest. They may occur on ridges, upper and mid slopes or on terraces and floodplains. Underlying bedrock may be sandstone, siltstone, shale, or limestone. Soils are widely varied including moderately well- to well-drained sandy to clayey loams. Most old fields receive moisture from rainfall, although some may receive floodwaters from nearby streams. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the fields, also provide energy sources.

Old field graminoid vegetation on the DBNF is usually comprised of several of the following species: tall fescue, Kentucky bluegrass, redtop, purpletop, panic grasses, and caric sedges. Weedy species such as velvet grass, crabgrass, and stoloniferous redtop may be present. Common forbs are goldenrods, sundrops, glaucous sunflower, nettle-leaf verbena, prairie petunia, tickseeds, and ground cherries. Weedy species such as wild carrot, chicory, oxeye daisy, and common dock may be present. Woody species such as blackberry, winged sumac, smooth sumac, persimmon, poison ivy, tulip poplar, sycamore, and white are often present. Multiflora rose and autumn olive are weedy woody species that are often present. This vegetation is short-lived without disturbance, becoming shrub land or young forest in 20 years or less.

D. Wet Fields

Wet fields are usually grassy, but may be shrubby. They occur across the DBNF on all ranger districts and in all Forest LTAs, but are not common. They most often occur on terraces of larger streams, but may be present on almost any topographic position. Many are maintained as grassy fields while others represent a successional stage in the change from crop field or pasture to forest. Underlying bedrock may be sandstone, siltstone, shale, or limestone. Wet fields tend to stay damp throughout the year and may actually have water standing on them (generally under 0.5 in, 1 cm). Water is received primarily from rainfall, but may be supplemented by floodwaters or seeps. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the fields, also provide energy sources.

Some wet fields may resemble old fields in their composition. Others are dominated by species such as deertongue and small-flowered panic grass. Goldenrods and asters may be present. Blackberry is common on these sites. Alder may also be present. Multiflora rose is a common weedy species in wet fields. The wetter sites maybe somewhat edaphically maintained, but most require mowing or other disturbance to prevent woody vegetation from invading and occupying the site.

E. Cool Season Grassland

Cool season grasslands are grassy. They occur across the DBNF, on all ranger districts and in all Forest LTAs. They are most common on upland sites, but are found on all physiographic positions. In most cases, these are habitats maintained as wildlife openings. Some represent temporary seeding of an area following ground disturbance and are expected to revert to shrub or forest condition. These grasses will grow on most soil types that are not water logged, and hence, the habitat is found on sandstone, siltstone, shale, and limestone. Water is received from rainfall, and in a few cases, floodwaters. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the fields, also provide energy sources.

Cool season grassland on the DBNF is usually in small parcels surrounded by forest and isolated from other similar lands or developments on adjacent private land. Domestic livestock grazes none of the DBNF cool season grassland. As a result, feral animal presence on DBNF cool grassland tends to be considerably less than on similar habitat on private land, and microconditions are somewhat different. Tall fescue and Kentucky bluegrass dominate cool season grassland on the DBNF. These areas are frequently nearly pure stands of fescue or more often, mixes of fescue with other grasses and forbs. Most of this fescue is 'Kentucky 31' or other endophyte-containing cultivar. Common milkweed, dogbane, chicory, and curly dock maybe found as well. Blackberry often invades the areas. These grasslands last for only 5-10 years with disturbance, such as mowing, before they become dominated by forb and shrub or tree species.

F. Pasture

Pasture is land maintained in more or less grassy condition to provide forage for livestock. Livestock themselves help provide some of the disturbance required to keep woody vegetation at a minimum. On the DBNF, only one area of active pasture exists, that on the Stanton Ranger District. This area is located primarily on bottomland. Two additional areas are located on the Stearns Ranger District, but neither is active except to provide occasional forage for visitor's horses. One of these sites is located on bottomland and other one is upland. The underlying bedrock at all three sites is sandstone/siltstone/shale. Soils are well drained, sandy to clayey loams. Rainfall is the primary source of water for all. The Stanton site periodically floods, while the Stearns bottomland site rarely floods. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and manure from resident or visiting animals also provides energy sources.

Vegetation on these sites is varied, but 'Kentucky 31' fescue is present at all three sites and Johnsongrass is an invasive exotic present on the two bottomland sites. The Stanton site is similar to an old field, but wet at the lower end. The upland Stearns site closely resembles an old field, but has some damp to wet areas near the intermittent creek which passes through it. The bottomland Stearns site most closely resembles cool season grassland. Woody vegetation will encroach on all with out active management to keep it out.

G. Fescue-Sericea Grassland

Forbs or grasses may dominate this habitat type. It is found across the DBNF, but is most abundant on the London, Somerset, Stearns, and Redbird districts in the following LTAs: North Fork Kentucky Cliffs (221Hc003), Northern Escarpment (221Hc004), Rockcastle Hills (221Hc005), and Southern Middle Breathitt Rugged Hills (221Ha001) (USDA Forest Service, 1997; 1996). This habitat is formed as a result of reclamation activities following coal surface mining. Mine tailings are shaped to approximate initial land contours, and then a soil-rock fragment mix is packed on this surface. The sites are usually seeded in 'Kentucky 31' tall fescue and sericea lespedeza. The underlying bedrock is a mix of sandstone, siltstone, shale, and coal. Soils are generally classified as Fairpoint (acid) or Bethesda (basic) series, which are 'cultural' soils composed of rock and coal fragments, and some remnant top and subsoils. They tend to be excessively drained, coarse, acid, and infertile. Occasional pockets of wet soils are encountered. Water is usually received from rainfall, but small seep pockets may be present. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation and byproducts of fires, which may pass through the areas, also provide energy sources.

Sericea lespedeza, tall fescue, or a combination of both, dominates this habitat type. Other species adapted to disturbed ground may be found including goldenrods, horseweed, oxeye daisy, sweet clovers, and crown vetch. Shrubs and trees including autumn olive, Virginia pine, and black locust may be present as planted or naturalized components of the vegetation. In areas that remain damp to wet, mosses may form dense mats under the other species. Swamp furrow moss is especially common in these areas.

Ponds associated with these grasslands maybe have either low or high quality water. Vegetation around and in them is similar to that described under the Lake and Pond Margins Habitat Association and General Standing Water Habitat Association.

H. Ruderal/Waste Areas

Grasses or forbs may dominate this habitat type. It is found across the DBNF, on every district and in every forest LTA. This habitat may be found along roadsides, on vacant ground, along old woods roads, at old house or building sites, old mine sites, and sometimes along streams. These sites often have areas of bare ground and may have small to large trash piles on them. Vehicles often travel through these areas, and foot traffic may be high. The underlying bedrock may be sandstone, siltstone, shale, or limestone. Soils are varied, ranging from sand to clay to loams to subsoil. Water is received primarily from rainfall. Sunlight, which drives photosynthesis, is the major source of energy. Decay of vegetation, and other organic matter, also provides energy sources.

Vegetation on this habitat is varied. It is often dominated by exotic species adapted to disturbed habitat. Fescue and sericea lespedeza are frequent on the sites. Chicory, oxeye daisy, spotted spurge, chickweed, tree-of-heaven, and mimosa are frequently found. Japanese knotweed is often present on moist or wet sites. Native species often encountered include ragweeds, panic grasses, rushes and sedges on wetter sites, winged sumac, and blackberries.

II. Current Status of the Habitat Association on the Daniel Boone National Forest

The Grassland Habitat Association is widespread on the DBNF and Cumberland Plateau, although all habitat types within it are not. The extent of the association is unknown, but individual occurrences can be found easily. On the DBNF, warm season grassland habitat is most abundant under powerline rights-of-way. More than 130 miles (209 km) of powerline right-of-way is present on the forest (USDA Forest Service, 1995). Estimates of 120 ac (49 ha) of wildlife openings maintained on the DBNF, are of this habitat type. Some of this habitat also occurs on private land, but the extent is unknown.

Meadows are rare throughout. Other than a few sites known near or on the forest, not much is known about the distribution and locations of this habitat. Old fields are found throughout the Cumberland Plateau. The extent of this type is unknown, but about 15 percent (292 ac, 118 ha) of the 1948 ac (788 ha) of wildlife openings documented on the DBNF (USDA Forest Service, 2001) is estimated to be of this type. Wet fields are scattered across the Cumberland Plateau; however, little is known about their distribution. Estimates of 30 ac (12 ha) of this habitat are present on the forest. Cool season grassland is not common on the Cumberland Plateau. About 80 percent (1558 ac, 630 ha) of the wildlife openings maintained on the Forest are cool season grassland. Pastureland is scattered across the Cumberland Plateau. It is more abundant on private land than on the DBNF, where about 400 ac (162 ha) of pastureland are present. Of this about 100 ac (40 ha) is not being maintained and is moving toward old field habitat conditions.

Fescue-sericea grassland is found throughout the Cumberland Plateau, but most abundantly in eastern Kentucky, east of the forest. Several large tracts (100-200 ac, 40-90 ha) of this habitat are found on the forest, on the Somerset and Redbird Ranger districts. Elsewhere the habitat is found as small (5-20 ac, 2-9 ha) tracts or narrow strips associated with contour mines. Ruderal/waste area habitat is found throughout the Cumberland Plateau. About 1980 mi (3187 km) of road corridor is present on the DBNF. Within the proclamation boundary, but outside National Forest land, another 2265 mi (3645 km) of road corridor is present (USDA Forest Service, 1997a). At least part of this corridor is in ruderal/waste area condition, but the extent is unknown. The amount of habitat provided by other areas is unknown. It is likely that this habitat is more abundant on private land than on National Forest land.

Warm season grassland is probably less common than it was 200-300 years ago when fire and grazing were more widespread across the Plateau. As open ground reverted to forest, this habitat type was reduced. Numerous records, both extant and historical, on the Plateau and Forest, of species associated with warm season grass suggest that the habitat was once much more abundant, especially on the southern portions of both. On the Plateau, the DBNF is and probably will be the primary provider of this habitat.

Meadow habitat, while rare, is probably most abundant in the higher elevations of eastern Kentucky. The few sites on or near the Forest are important for local diversity, and should be maintained for overall diversity. The forest is unlikely to be able to create any additional areas of this habitat because of the complex hydrology and species composition. There are probably fewer sites of this habitat on the Plateau than prior to European settlement. These areas would have provided immediate forage for livestock, and after draining, easy to work fields. Following disturbance, many would have grown up in woody vegetation.

Old fields are less common now than they would have been 70-80 years ago when farmland was abandoned and much sold to the government. Old fields are more abundant now than would have been the case 200-300 years ago. However, about 500 years ago and prior, old fields probably were abundant as Native Americans moved from area to area leaving behind parcels of previously cultivated land. Cool season grassland is probably not a habitat that existed on the Plateau prior to National Forest management, except as a wet field or meadow variant. Even these variants would not have been the same as the variants were and are dominated by native species. Cool season grassland on the Forest is now maintained specifically to provide forage and other habitat for a variety of species in a setting little disturbed by domestic predatory animals (i.e., dogs and cats) and other daily human influences such as tractors, cattle and people, associated with pastureland. The DBNF will be the primary provider of this habitat on the Plateau.

Pastureland is scattered across the Plateau. It is less common today, including on the DBNF than it was 70-100 years ago. Much of what was cleared for pasture in the 1800s has reverted to forest. The forest provides little of the total amount of this habitat on the Cumberland Plateau, and is unlikely to provide any additional in the foreseeable future. Many areas of pastureland are immediately adjacent to DBNF lands and these will for some time provide benefit to those species that can use it.

Fescue-sericea grassland is common on the Cumberland Plateau, but most abundant in southern and eastern portions. This habitat type did not exist prior to the large surface and contour mining projects that began about 1950 and continue today. The DBNF is not likely to maintain this habitat, and will continue to allow natural succession to occur or actively modify the existing vegetation. The forest is not likely to be actively providing this habitat for species on the forest or Plateau. Ruderal/waste area habitat is found throughout the Plateau. The habitat has probably existed in some form on the Plateau as long as humans have maintained a farming or other non-nomadic life style. It is probably more abundant on non-DBNF land than on the forest. This is habitat that is more abundant today than 200 years ago. The forest is unlikely to maintain this habitat as such, but it is likely to continue to exist on the forest.

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The management goal for the Grassland Habitat Association is to maintain the physical and biological conditions that will result in a high likelihood that species dependent on this association will persist on the forest over the planning period.

The strategy to accomplish this goal focuses on maintaining areas of unforested land in a variety of vegetative conditions. Additional standards and guidelines are also recommended when other management measures are needed to insure the viability of a particular species associated with this habitat association.

The desired future condition of this habitat association is a system of open, grass, grass/forb, or low shrub areas within a matrix of forested land.

A. Habitat Association General Direction and Standards and Guidelines

1. Management activities to maintain association.

- Grassland openings will be distributed forest wide. They will not be created or maintained in wilderness areas or other designated areas where specific direction prohibits this activity.
 - *Rationale: The organisms that require or make use of this habitat type occur across the forest.*
- The placement and management of grassland openings on the forest will take into consideration the available amount and type of grassland opening available on National Forest and adjacent property (FLRMP, IV:14-15, in part).
 - *Rationale: Regulations require the Forest Service to manage habitat within ownership, but ecosystem management practices dictate consideration of all adjacent land conditions when making decisions.*
- An array of grassland types will be distributed across the forest and placed by type based on ecological capabilities, and needs of species at risk.

- *Rationale: Ecosystem management requires that species be promoted on sites best suited to grow them. A variety of grassland types should be present across the forest to supply habitat for species at risk where they occur.*
- Maintain an average of 2300 acres of grassland openings across the forest across the planning period.
 - *Rationale: This amount is about 350 acres above the amount present on the ground in 2001. The increase is to allow maintenance of large blocks of open land on the Somerset Ranger District. The 2300-acre amount is the amount that funding and personnel can reasonably support based on amount maintained at peak funding and staffing in last planning period. Historically much of this habitat was provided by barrens, not openings per se and additional needs may be met with this habitat type.*
- Grassland areas within generally forested areas will usually be between 1 and 15 acres area. Smaller or larger areas may be maintained as needed to provide habitat to provide for continued existence of species at risk, on a site-specific basis. (FLRMP, IV:15, in part)
 - *Rationale: Grassland areas smaller than 1 ac are difficult to maintain with cost effectiveness. Grassland areas larger than 15 ac within a forest matrix may contribute to habitat fragmentation affecting species at risk. If required for viability needs, openings outside this range are permissible.*
- Grassland areas of 0.5 ac or larger should be created and managed with irregular boundaries. (FLMRP, IV: 15, in part)
 - *Rationale: Regular edges, such as straight lines and circles, are not natural features. Such edges increase edge sharpness and potential barriers to species movements. Areas under 0.5 ac size with irregular edge are difficult to maintain and are less likely to create edge barriers.*
- Except for large areas greater than 15 ac, grassland areas will be placed to provide escape cover on at least one side (FLRMP, IV:15, in part).
 - *Rationale: Animal species either requiring grasslands or which make use of them may be subject to undo natural or cultural risk without escape cover.*
- Warm season grassland will be favored in habitat matrices dominated by oak, yellow pine, or mixed type barrens (low BA, open forest) or pine and mixed type forest.
 - *Rationale: This combination of habitat occurs naturally, and based on recent studies, was more common on the forest than is found today. Fire is important in the maintenance of both, and species dependent on one often will use the*

other, or in the case of many butterflies, including Diana fritillary, tend to make use of the ecotone between them.

- Grassland areas will be mowed, burned under prescription, disked, or otherwise managed to maintain a desirable mix of nonforest vegetation on the sites. Emphasize prescribed burning for old field and warm season habitat types, and in others where burning will meet objectives.
 - *Rationale: In most cases, tall shrub or tree species will, over time, invade grassy or low shrub vegetation changing the physical and biological characteristics of the sites. These species must be removed or set back to maintain grassland opening characteristics. Fire is an important element for the health of some habitat types, and may be an effective and cost efficient tool in others.*
- Native vegetation, appropriate for the site conditions, will be emphasized in grassland openings. Non-native species, such as endophyte-free fescue, are permitted where specific viability needs are provided by such species. No species listed on the Regional Forester's Invasive Exotic Plant Species list, Category 1, will be intentionally planted or maintained in grassland areas. The use of Category 2 species must be justified in writing, on a site-specific basis.
 - *Rationale: Ecosystem management, and management for forest health, emphasize healthy, natural systems. Off-site species tend to be less vigorous than species not suited to the given conditions. Exotic species have a place in management for specific, specialized uses, but in widespread use, are not consistent with healthy, native systems. Invasive species are known to cause damage to healthy ecosystems. Others suspected of causing damage should be used sparingly.*
- Ponds, either ephemeral or permanent, or both, may be incorporated in grassland areas.
 - *Rationale: Ponds in grassland provide a readily accessible water source for many species, including aquatic and semi-aquatic species requiring open conditions. The open conditions of grassland areas facilitate the construction of ponds. Grouping habitat features together may reduce maintenance costs.*
- Activities such as roads, trails, and scenic vistas may be permitted in and along grassy habitat areas as long as they do not negatively impact PETS species or their potential habitat.
 - *Rationale: Limited use of the grassy habitat areas may not affect species viability on a site-specific basis.*
- Open grassy areas under and along rights-of-way may provide grassland habitat, and such contributions should be considered in the management of the Grassland

Habitat Association, but are not counted in the forest total. In addition, this habitat will be managed according to permit standards and agreements made with permit holders. When possible, enter into agreements with permittees to manage specific sections of rights-of-way in a manner conducive to viability needs while maintaining permit obligations. (FLRMP, IV:41, 129; in part)

- *Rationale: Within the limits of permitted activities, and policy or regulation regarding PETS species, permit holders have the right and responsibility to manage the vegetation consistent with operation of the right-of-way. This supercedes guidelines for the grassy habitat association.*
- Fescue-Sericea grassland will not be maintained as such. Where possible, it will be converted to other desirable grassland or barrens types, taking into consideration the amount and type of grassland habitat on nearby National Forest and private land. Where conversion is impractical or creates unacceptable erosion hazards, fescue-sericea grassland will be either planted to trees or allowed to revert to forest through natural processes.
 - *Rationale: Neither of the dominant species in fescue-sericea grassland is native nor is considered a desirable non-native species. Recent direction from the Regional Forester encourages, but does not require the removal of these species from National Forest lands. These areas lend themselves to creating other grassland habitat, and often provide larger parcels of land for this purpose if needed.*
- Protective measures such as informational signing, posting sites closed and/or barrier construction may be applied to sites that are receiving resource damage through inadvertent human activity.
 - *Rationale: Human use of site-specific areas may need to be modified or restricted.*
- Management activities concentrating public use in the vicinity of sensitive grassy areas would be avoided if detrimental impacts were likely to occur.
 - *Rationale: Site-specific activities need to be evaluated to determine the level of potential inadvertent human impacts to species associated with this habitat association.*

(S&Gs developed based on direction in SHNS amendment for other limited or rare habitats or features providing specialized habitat, and on personal observations; by Taylor, 2001)

2. Protect or enhance habitat for PETS species.

- Maintain all grassland habitat supporting PETS species.
 - *Rationale: In consideration of all available grassland habitat in the area on both National Forest and private land, some parcels supporting PETS might not be needed for overall distribution objectives. However, site specifically they are needed for these species at risk.*
- Employ management tools and cycles for maintenance of grassland habitats that favor PETS species using the habitats.
 - *Rationale: Any number of management tools and cycles may maintain the habitat in grassy condition, but not all create the same microhabitat conditions on the ground.*
- Evaluate grassland habitat sites to determine the capacity of the site to support reintroduction of species at risk.
 - *Rationale: Reintroduction of native species extirpated from the DBNF or present in low numbers likely to adversely affect viability may be appropriate action, but is not warranted if habitat conditions will not support the species.*
- Specific grassland sites will be signed or gated to restrict entry where needed.
 - *Rationale: If use of specific grassland areas results in damage to PETS species or their habitat, measures need to be taken to alert the public of the damage and ways to avoid the damage, or to restrict entry if needed to repair the damage.*
- Sites providing potential (undocumented) habitat PETS species will be managed to provide the conditions needed by these species.
 - *Rationale: Many sites are undocumented, especially small, possibly natural, sites. Systematic inventories of both grassland habitat and the organisms that live in them have not been completed.*
- Acquire private lands from willing sellers with known grassland sites supporting PETS species.
 - *Rationale: The need for protecting grassland sites supporting PETS is needed considering these species are rare or have their existence in someway threatened.*

(S&Gs added based on general PETS management goals per ESA and FS policy (FSM 2670); Taylor 2001)

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

- Maintain an inventory of grassland areas with spatial and tabular attributes including but not limited to, location, size, type of grassland, condition, and the presence of any species at risk. (High Priority)
 - *Rationale: An inventory of grassland openings provides information on which to base management decisions, track yearly and plan period maintenance accomplishments, and estimate habitat suitable for various species at risk.*
- Monitor MAR and other reporting systems to help determine accomplishments for each year and the planning period. (High Priority)
 - *Rationale: MAR and other reporting systems will be filled out yearly. Use data as reported to help verify inventory.*
- Monitor grassland areas for invasive exotic species, primarily plants, which may compromise habitat conditions. (High Priority)
 - *Rationale: Invasive exotics can spread quickly, taking over and rendering unusable or marginal grassland habitat, as well as choking out plants at risk.*

References:

- USDA Forest Service. 1995. Utility Corridors GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1996. Landtype association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1997. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest, Winchester, KY.
- USDA Forest Service. 1997a. Roads GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 2001. Unpublished Openings data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY

Attachment A.

Species List: Grassland Habitat Association

Class	Common Name/ Species
ANIMALS	
Amphibians	Green Frog/ <i>Rana clamitans</i>
Birds	Bachman's Sparrow/ <i>Aimophila aestivalis</i> Henslow's Sparrow/ <i>Ammodramus henslowii</i> Grasshopper sparrow/ <i>Ammodramus savannarum</i> Ruby-throated hummingbird/ <i>Archilochus colubris</i> Chuck-will's widow/ <i>Caprimulgus carolinensis</i> Whip-poor-will/ <i>Caprimulgus vociferus</i> Lark sparrow/ <i>Chondestes grammacus</i> Northern Harrier/ <i>Circus cyaneus</i> Sedge Wren/ <i>Cistothorus platensis</i> Northern Bobwhite/ <i>Colinus virginianus</i> Prairie warbler/ <i>Dendroica discolor</i> Chestnut-sided warbler/ <i>Dendroica pensylvanica</i> Gray catbird/ <i>Dumetella carolinensis</i> Least flycatcher/ <i>Empidonax minimus</i> Common yellowthroat/ <i>Geothlypis trichas</i> Yellow-breasted Chat/ <i>Icteria virens</i> Migrant Loggerhead Shrike/ <i>Lanius ludovicianus migrans</i> Eastern Towhee/ <i>Pipilo erythrophthalmus</i> American Woodcock/ <i>Scolopax minor</i> Chipping sparrow/ <i>Spizella passerina</i> Field sparrow/ <i>Spizella pusilla</i> Bewick's Wren/ <i>Thryomanes bewickii altus</i> Golden-winged warbler/ <i>Vermivora chrysoptera</i>
Insects	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i> Diana Fritillary/ <i>Speyeria diana</i> Regal Fritillary/ <i>Speyeria idalia</i>
Mammals	Virginia Big-eared Bat/ <i>Corynorhinus (Plecotus) townsendii virginianus</i>
Reptiles	Corn Snake/ <i>Elaphe gutta gutta</i> Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i> Eastern Earth Snake/ <i>Virginia valeriae valeriae</i>
PLANTS	
Dicots	Running Serviceberry/ <i>Amelanchier stolonifera</i> Brook Saxifrage/ <i>Boykinia acontifolia</i>

Class	Common Name/ Species
	Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>
	Prairie Redroot/ <i>Ceanothus herbaceus</i>
	White-leaf Leather-flower/ <i>Clematis glaucophylla</i>
	Sweet-fern/ <i>Comptonia peregrina</i>
	Yucca-leaved Rattlesnake Master/ <i>Eryngium yuccifolium</i>
	Yellow Gentian/ <i>Gentiana alba</i>
	St. Peter's-wort/ <i>Hypericum crux-andreae</i>
	Vetchling Peavine/ <i>Lathyrus palustris</i>
	American Gromwell/ <i>Lithospermum latifolium</i>
	Nuttall's Lobelia/ <i>Lobelia nuttallii</i>
	Fraser's Loosestrife/ <i>Lysimachia fraseri</i>
	Barbara's Buttons/ <i>Marshallia grandiflora</i>
	American Cow-wheat/ <i>Melampyrum lineare</i> var. <i>lineare</i>
	Thread-leaf Sundrops/ <i>Oenothera linifolia</i>
	Small Sundrops/ <i>Oenothera perennis</i>
	Mountain Lover/ <i>Paxistima canbyi</i>
	Cross-leaf Milkwort/ <i>Polygala cruciata</i> var. <i>cruciata</i>
	Racemed Milkwort/ <i>Polygala polygama</i> var. <i>polygama</i>
	Hairy Snout Bean/ <i>Rhynchosia tomentosa</i>
	Slender Marsh-pink/ <i>Sabatia campanulata</i>
	Short-stem Ragwort/ <i>Senecio pauperculus</i>
	Royal Catchfly/ <i>Silene regia</i>
	Velvet Bush Pea/ <i>Thermopsis mollis</i> (generic)
	Nettle-leaf Noseburn/ <i>Tragia urticifolia</i>
	Narrow-leaved Bluecurls/ <i>Trichostema setaceum</i>
	Running Buffalo Clover/ <i>Trifolium stoloniferum</i>
	New York Ironweed/ <i>Vernonia noveboracensis</i>
	Bird's-foot Violet/ <i>Viola pedata</i>
Ferns	Engelmann's Quillwort/ <i>Isoetes engelmannii</i>
Gymnosperms	Eastern Redcedar/ <i>Juniperus virginiana</i>
Monocots	Grass-pink/ <i>Calopogon tuberosus</i>
	Carex Sedge/ <i>Carex emoryi</i>
	Uptight Caric Sedge/ <i>Carex stricta</i>
	Wild Yam/ <i>Dioscorea villosa</i>
	Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i>
	Wood Lily/ <i>Lilium philadelphicum</i> var. <i>philadelphicum</i>
	Loesel's Twayblade/ <i>Liparis loeselii</i>
	Plains Muhlygrass/ <i>Muhlenbergia cuspidata</i>
	Yellow-crested Orchid/ <i>Platanthera cristata</i>
	Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
	Globe Beaked-rush/ <i>Rhynchospora globularis</i> var. <i>globularis</i>
	Shining Ladies'-tresses/ <i>Spiranthes lucida</i>
	Great Plains Ladies'-tresses/ <i>Spiranthes magnicamporum</i>

07/15/2003

Rough Dropseed/ *Sporobolus clandestinus*

Mosses

Cataract Metal Moss/ *Scopelophila cataractae*

Attachment B.

Grassland Species/Habitat Relationships with References

Amphibians

Green frog – *Rana clamitans* – This frog is a semi-aquatic species occupying many of the same habitats as the large bullfrog, e.g. permanent bodies of water. The green frog can be observed in shallow water, such as springs, seeps, ponds, reservoirs, creeks, beaver ponds, ditches, bogs, floodplain pools, and swamps. The green frog requires semi-permanent water and is an opportunistic feeder. The green frog's diet includes arthropods, snails and worms (Martof et al., 1980). The green frog prefers ponds, floodplain swamps or marshy habitat with grassy edges and emergent vegetation. (Wilson, 1995)

Birds

Bachman's Sparrow – *Aimophila aestivalis* – This species typically requires dense grassy places where scattered trees or saplings are present, usually in pine forests (Hamel, 1992). Historically found in mature to old growth southern pine woodlands subject to frequent growing-season fires (NatureServe, 2001). This provided the grassy undergrowth required by this species. This species formerly inhabited a variety of early successional habitats in KY (Palmer-Ball, 1996). This species would be expected to occur in stands with a well-developed warm-season grass understory or in meadows in which native species predominate.

Henslow's Sparrow – *Ammodramus henslowii* – This species is typically found in open habitats dominated by thick, grassy vegetations (Palmer-Ball, 1996). Some typical habitat requirements include dense herbaceous vegetation, ground litter, an intermediate moisture range, and singing perches (DeGraaf et. al., 1991). This species is usually associated with grassland habitat such as warm-season grass prairie remnants.

Grasshopper Sparrow – *Ammodramus savannarum* – This species inhabits grasslands that are dominated by relatively sparse or short vegetation (Palmer-Ball, 1996). It may use fields of several types where the vegetation is approximately 1 foot high (Hamel, 1992). Brushy situations are typically not occupied by this species, as it requires rather open fields with herbaceous cover. This species would be expected to occur in large tracts of fescue or cool season grasslands.

Whip-poor-will – *Caprimulgus vociferous* – Whip-poor-wills occupy areas with medium growth hardwood and mixed forest, often in upland and edge habitats. The birds forage for insects in grassy forest openings and fields. Breeding is in forest and forest edges, usually near fields and open habitat. This species requires areas of extensive forest. Whip-poor-wills would frequent grassland areas primarily for foraging.

Northern Harrier – *Circus cyaneus* – This is a species of open country, weedy fields, and marshes. Wooded habitats are not used. Northern Harriers were more prevalent in

Kentucky in the past, before the destruction of native prairies. Harriers have bred in small numbers on reclaimed surface mines in the State, nesting amid dense cover of tall grasses. When trees are planted during reclamation...the harriers probably use the mines only for a limited number of years (Palmer-Ball 1996). On the DBNF, this species has been observed over Ano strip mines on the Somerset Ranger District and over large hayfields on the Stearns R.D. and would be expected to frequent un-mowed sericea-fescue grasslands and large tracts of un-mowed pasture, cool season grasslands and meadows (L.Perry, pers. obs.).

Sedge Wren – *Cistothorus platensis* – This is a species of low, wet grasslands. Moist meadows and the grassy margins of marshes and bogs are favored. In Kentucky, the birds also inhabit hayfields, overgrown pastures and fallow fields; areas that provide the thick, herbaceous cover the birds require (Palmer-Ball 1996). Nests are in grasses and sedges of weedy fields and in dense clumps of sedges growing in moist spots (Mengel 1965).

Northern Bobwhite – *Colinus virginianus* – Bobwhite utilize a variety of open and semi-open habitats, including woodland (especially pine), fields, fencerows, cedar thickets, and forest edges. Bobwhite prefer abandoned fields, warm season grasses and clover, although they do occur in smaller numbers in fescue. They are particularly fond of brushy conditions. Nests are made in grassy/weedy, fairly open areas near cover provided by forest edge or brushy borders. On the DBNF, birds are frequently observed with broods in open, pine-hardwood stands that have been heavily burned and have open, well-lit understory with scattered warm-season grasses and forbs (L. Perry, pers. obs.).

Prairie Warbler – *Dendroica discolor* – Prairie Warblers occur in semi-open, early successional, and woodland habitats. Mixed forest types—especially those that have been cutover or burned--with pines and cedars are occupied. Forest edges, clearings, brushy borders, and overgrown fields with scattered saplings or small trees are commonly used. On the DBNF, the birds are nearly always found in early successional habitat, especially young clearcuts and the undergrowth of shelterwood cuts, and often at wood edges and in stands that have been burned (L. Perry, pers. obs.). This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Chestnut-sided Warbler – *Dendroica pensylvanica* – This is typically a bird of early successional openings and forest edge where a dense shrub layer of weeds, briars, and young trees predominate (Palmer-Ball, 1996). This species is usually found in the mountains above 3500 feet but may occur sparingly down to 2000 feet (Hamel, 1992). Tends to inhabit rather open and dry areas having some woody vegetation in the form of shrubs and small trees (DeGraaf et. al. et. al., 1991). This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Gray Catbird – *Dumetella carolinensis* – This species most frequently inhabits old fields, woodland edge, forest clear-cuts and rural settlement areas. Wherever it occurs the species is typically associated with dense brushy cover (Palmer-Ball, 1996). Prefers moist, dense, dark, tangled vegetation especially in shrubbery (Hamel, 1992).

Monitoring records on the DBNF indicate that this species is most common in the non-forested habitat group. This indicates that most occurrences were in old fields or openings. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Least Flycatcher – *Empidonax minimus* – This is a species of open conditions; it is rarely encountered deep in the forest. Open, deciduous woods (particularly those that have been disturbed by burning or logging), forest edge, fields with scattered large trees, and other habitats that provide early successional conditions are utilized. During spring migration, Mengel observed male birds in alders and willows in a marshy, Laurel County meadow (1965). Most of the breeding population frequents elevations above 2500 feet. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Common Yellowthroat – *Geothlypis trichas* – This species is typical of areas with shrubs, brush or tall herbs generally in more open country that is somewhat moist in nature (Hamel, 1992). Usually found in abandon fields, areas with grassy or shrubby borders, marshes, low damp meadows with a profusion of rank growth, and remnants of tallgrass prairies (Palmer-Ball, 1996). Monitoring data collected on the DBNF indicates that this species was most common in non-forested areas less than 10 years old. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Yellow-breasted Chat – *Icteria virens* – This is a species of early successional habitats, including: thickets; overgrown fields; hedgerows; forest edges; and openings. The key requirement is dense cover of shrubs and/or saplings. These birds avoid mature forest interiors and nest in shrubby, brushy areas. On the DBNF, they are often encountered in thickets, (regenerating) clear-cut, and dense undergrowth of shelterwood cuts—nearly always in cutover or early successional habitat (L. Perry, pers. obs.). The species tends to be more abundant in harvested than in non-harvested areas (Baker and Lacki 1997). This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Migrant Loggerhead Shrike – *Lanius ludovicianus migrans* – Loggerhead Shrikes are more common in south-central and western KY than in the Cumberland Plateau (Palmer-Ball 1996); they are rarely found in areas of extensive forest. Fields, pastures, cultivated fields and other semi-open to open habitats with short grasses, sparse ground cover, or bare soil is frequented. Scattered trees and snags, shrubs, fences, or telephone wires must be present for perching. Nesting is in dense trees and shrubs, with thorny species being preferred.

Eastern Towhee – *Pipilo erythrophthalmus* – This species typically occurs in managed or artificial situations such as brushy forest edge, regenerating clear-cuts, and forest

disturbed by selective logging (Palmer-Ball, 1996). It may also be found in the lower growth of open or cutover forest (Mengel, 1965). This species is dependent on dense brushy cover (DeGraaf et. al., 1991) that may be found in a variety of situations. Monitoring data collected on the DBNF indicates that this species is most common in mixed pine habitat less than 10 years old. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

American Woodcock – *Scolopax minor* – This species typically requires moist woodlands in early stages of succession. It may use open fields, cultivated land, pastures and clearings at least ¼ acre in size (DeGraaf et. al. et. al., 1991). It generally requires poorly drained soils with an abundance of earthworms for feeding, nearby fields or small forest openings for courtship and roost site (DeGraaf et. al. et. al., 1991) and is largely absent from extensive areas of mature forest (Palmer-Ball, 1996). The presences of edge habitat and a high shrub stem density may be important for nest site selection in some areas (NatureServe, 2001). Appears to be partial to sheltered wet thickets along meandering streams (Barbour et. al., 1973). Within the grassland association, this species would be most expected to be found in wet fields which it would utilize for feeding and nesting and will often select grassy openings as sites in which to conduct aerial breeding displays.

Chipping Sparrow – *Spizella passerina* – This species occurs mainly in grassland areas with scattered trees (DeGraaf et. al., 1991) or in open woodlands where the understory is sparse as a result of grazing, burning or soil conditions (Mengel, 1965). It may occur in moderate numbers in open pine-oak upland forest on dry ridges of the Cumberland Plateau (Mengel, 1965). In KY this species is frequently found in forested areas dissected by numerous small to moderate sized openings (Palmer-Ball, 1996). DBNF monitoring data indicates that the greatest number of occurrences were in mixed-pine habitat less than 10 years old. The chipping sparrow would be likely to feed in stands of open cool season grasses and other grassland areas where the grass is not dense or tall (L. Perry, pers. obs).

Field Sparrow – *Spizella pusilla* – Primary habitats for this species include weedy fields, broomsedge fields, hedgerows and thickets (Hamel, 1992). These habitats may occur in association with other forested conditions. They typically nest in open, brushy situations although they sometimes use woodland edges (Palmer-Ball, 1996). May use cut over pine forests and burned over woodlands wherever briars and brush have regenerated (DeGraaf et. al., 1991). Monitoring on the DBNF indicates that this species is most common in non-forested areas such as old fields and wildlife openings. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Bewick's Wren – *Thryomanes bewickii altus* – Habitat requirements for this species are open country with shrubs, saplings and/or brushpiles and snags at least 6 inches in diameter (Hamel, 1992). May occur in open forests but requires a brushy understory (DeGraaf et. al. et. al., 1991). Nest are built in cavities, crannies, or placed on ledges.

This species does not construct its own cavities (Hamel, 1992). In KY small numbers may also inhabit suburban yards in towns, brushy forest margins and forest clear-cuts (Palmer-Ball, 1996). This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Golden-winged Warbler – *Vermivora chrysoptera* – This species favors abandon fields with scattered deciduous trees (Hamel, 1992). It occurs in greatest numbers at elevations between 2000 and 4000 feet but may rarely occur lower (Hamel, 1992). In Kentucky the species is generally a bird of the drier slopes that have been cleared in the recent past, including reverting clear-cuts (Palmer-Ball, 1996). Kentucky populations are basically restricted to the higher elevations in the mountainous region in the southeastern part of the state. This species would be expected to nest and forage in grasslands composed of tall un-mowed vegetation and a mix of shrubby undergrowth and briars, such as often occurs in old-field situations.

Insects

Appalachian Grizzled Skipper – *Pyrgus wyandot* – In Kentucky, *Pyrgus wyandot* is only known from eastern shale barrens in Harlan County. Elsewhere it is known to occur in open areas near woods, including valley bottoms, barrens, meadows, grassy hillsides and scrub oak openings. Its food sources include wild strawberry, Canadian cinquefoil, blueberry, and plants belonging the rose family.

Diana Fritillary – *Speyeria diana* – On the Daniel Boone, *Speyeria diana* is found in open areas and within the forest especially those that are open and well-lit. These conditions mimic open prairies and pine barrens from which the species is known out west and may be found along grassland/forest edge or in forests that have been maintained in an open condition by repeated fires. The caterpillar feeds almost exclusively on violets and overwinter above-ground making them sensitive to spring and fall fires. Midstory removal and prescribed fire can create high quality foraging habitat for adults by increasing nectar sources. A variety of species are used, including common and swamp milkweeds, ironweed, red clover, coneflowers and butterfly bush. Individuals will use small openings and roadsides along forest edges in search of nectar plants, but do not go far from the woods.

Regal Fritillary – *Speyeria spedia* – was once considered common in the natural grasslands, pastures and wet meadows of the northeastern United States. In the mid-west, fire-maintained oak-pine barrens supplied significant amounts of habitat for the Regal Fritillary. Food sources include violets, milkweeds, thistles, and other nectar producers. This species is now considered to be extirpated from Kentucky.

Reptiles

Northern Scarlet Snake – *Cemophora coccinea copei* – This is a burrowing species that is rarely seen, typically venturing out only at night or after heavy rains. It is usually found under logs, stones, leaf litter, pine needles, or bark; it is occasionally turned up during

plowing or excavation work (Behler and King 1979; Conant and Collins 1991). While they have occasionally been found in open fields and residential areas, Scarlet Snakes primarily occur in woodlands, including pine, hardwood, and mixed forests (Barbour 1971) with sandy or other friable, well-drained soils that are suitable for burrowing. They are most common in open habitat and benefit from management practices, such as periodic burning and selective thinning, that retain open canopy, early successional conditions (Wilson 1995). Scarlet Snakes feed on the eggs of other reptiles, and on mice, insects, smaller snakes, lizards, and salamanders.

Corn Snake – *Elaphe guttata guttata* – Although this subspecies occurs in disjunct populations in eastern and west-central KY, Corn Snakes in general are much more common in other southeastern States. Typical habitat includes pine and pine-hardwood forests, rocky hillsides, old fields, openings within bottomland hardwoods, and, to a lesser extent, forested swamps. Open woodland, ranging from uplands to lowlands, with an abundance of rocks and logs for cover is preferred--especially when bordering old or cultivated fields that increase foraging success. Corn snakes are fairly secretive, spending much of their time concealed under surface cover, in stumps, under bark, or in the burrows of other animals (Wilson 1995). However, they readily climb trees and enter abandoned houses and barns in search of prey: mice, rats, birds, and bats (Behler and King 1979). These snakes are most often encountered along woodland edges, overgrown fencerows, and around farmsteads (Barbour 1971).

Eastern Slender Glass Lizard – *Ophisaurus attenuatus longicaudus* – This is a species of dry, often sandy, soil conditions. It occurs in relatively open, typically upland, habitats--including Virginia and Shortleaf Pine and pine-oak stands, forest edges, grassy fields and prairies--which have loose, friable soils. This secretive, legless lizard tends to stay in old rodent burrows and under mats of dead grass and decomposing plants; when it basks in the sun, it is often hidden in tall grass or with only part of its body showing (VA Dept. of Game and Inland Fisheries 2001). Slender Glass Lizard diets include insects, spiders, birds' eggs, smaller lizards, and snakes. Prescribed burning and other management practices that help to create open canopy conditions benefit this lizard species.

Eastern Earth Snake – *Virginia valeriae valeriae* – This is a small, highly secretive snake about whose habits much remains unknown. It is sometimes seen on the ground surface following heavy rains, but spends most of its time under leaf litter, logs, warm rocks and stones. Diet consists of earthworms, insects and their larvae, and other small arthropods. Its habitats include: damp, open, deciduous and pine-hardwood forests; abandoned fields; trail and back roads areas; wooded residential areas; forest edge and openings; moist, rocky slopes and hillsides with open canopies. Earth Snakes may congregate in small numbers prior to hibernation in pockets of woodland debris or under large rocks (Behler and King 1979).

Plants

Dicots

Running serviceberry – *Amelanchier stolonifera* – is a montaine Appalachian species that

is found in rocky and sandy soil in dry, open hardwood forest. The only Kentucky record is from the DBNF area. It is located on rocky soils on a limestone ridge in dry open oak-cedar forest.

Brook Saxifrage – *Boykinia acontifolia* – is found throughout its range associated with stream banks. It may also grow in wet meadows. It grows on continually wet, sandy or rocky banks just above summer water levels. It is usually found in moderate shade.

Scarlet Indian Paintbrush – *Castilleja coccinea* – is found in warm season grasslands, open upland hardwood or pine forest and occasionally along roadsides. The species requires moderate to high levels of light. It responds favorably to fire, which helps to maintain the species habitat.

Prairie Redroot – *Ceanothus herbaceous* – is a midwestern species associated with rocky soils in grasslands and along streams. The Kentucky records occur in the DBNF area, where it occurs only on boulder and cobble bars associated with larger streams. The habitat is open and is maintained open by periodic scouring during flood events.

White-leaf Leather-flower – *Clematis glaucophylla* – is a southern species. On the DBNF, it occurs associated with sandstone or conglomerate cobble-boulder bars along larger rivers, and at the edge of prairie-like areas.

Throughout most of its range, sweet fern – *Comptonia peregrina* – is associated with open, sterile, sandy ground where it forms dense, low thickets. In this habitat, fires probably helped maintain the habitat. On the DBNF, this species inhabits open cobble/boulder bars along free-flowing rivers. The plants are found rooted deep in the crevices between boulders. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition.

Yucca-leaved Rattlesnake Master – *Eryngium yuccifolium* – is coastal plain and prairie species associated with moist to wet warm season grassland. It is also found in open, wet yellow pine savanna and moist to wet fields. On the DBNF, it is known from two sites, one, a moist warm season grassland in a powerline right-of-way, and the other in a moist area of an old field. The species requires moderate to high light and moist conditions.

Yellow Gentian – *Gentiana alba (flavida)* – is a prairie species with range extensions into the Appalachian Plateaus. It occurs in open warm season grassland and open oak or oak-yellow pine forest. On the DBNF it occurs in prairie-like areas, dominated by warm season grasses.

St. Peter's-wort – *Hypericum crux-andreae* – is a coastal plain species with scattered populations in the interior. The species grows on usually damp sandy soil, in roadside ditches, and in open, wet yellow pine forest. On the DBNF, it occurs in open, wet warm season grassland. These sites were likely forested, but open prior to their current condition.

Vetchling Peavine – *Lathyrus palustris* – is found on the coastal plain and in the mountains of eastern North America. It is typically found in or at the edge of floodplain forest, swamps, wet meadows or streamside fields, and riverbanks. On the DBNF, this species occurs on terrace forest of larger streams.

American Gromwell – *Lithospermum latifolium* – occurs in the northeastern US down through the central Appalachians. It grows in open, dry-mesic forest. On the DBNF, it is usually found on calcareous sites in dry-mesic oak forest or mesic mixed hardwoods.

Nuttall's Lobelia – *Lobelia nuttalli* – is a coastal plain species with stations inland along the southern Appalachian Plateaus. The species is found in open sandy swamps, wet yellow pine savannas, and wetlands. On the DBNF, it is known from wet meadows and wet warm season grassland.

Fraser's Loosestrife – *Lysimachia fraseri* – is a southern Appalachian Mountains species. It is found in open meadows and along roadsides. On the DBNF, one site is known from open, forested river terrace.

Marshallia grandiflora – This species inhabits open cobble/boulder bars along free-flowing rivers. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition. Currently this species is not known from the DBNF, but habitat for it may exist on some streams within the Cumberland River drainage.

The DBNF variety of American Cow-wheat – *Melampyrum lineare* var. *pectinatum* – has been carried as var. *lineare* on the DBNF based on a literature citation. Medley (1993) argues against this and places all plants in the DBNF area in var. *pectinatum*. This is a coastal plain species. It is found in sandy, open yellow pine forest. On the DBNF, the sole station for the species is from ridgetop dry-xeric oak and oak-yellow pine forest.

Thread-leaf Sundrops – *Oenothera linifolia* – is a central US species found in sandy grassland and open rocky areas. On the DBNF, the species is found in sandy warm season grassland and on sandstone glades.

Small Sundrops – *Oenothera perennis* – is a midwestern species found in open forest, prairies, meadows and fields. On the DBNF, it is known from open dry-mesic ridge top oak forest. The species requires moderate to full sunlight. It and its habitat are probably enhanced by fire.

Paxistima canbyi – This species is an Appalachian provinces species that occurs on thin soils associated with limestone (or other calcareous) cliffs. These sites are usually within a hundred feet or so from the cliff edge, are dry, and tend to have a southerly (SE to NW) aspect. The sites often have a closed canopy, but the midstory and shrub layers are thin and open. It rarely is found in old fields. At one site observed on private land, the cutting of the overstory (usually eastern red cedar, *Juniperus virginiana* and oak species, *Quercus* spp.) resulted in a thick coppice of tree and shrub species. Over a two-year

period, the *Paxistima* population was nearly eliminated. The species is probably not tolerant of fire.

Cross-leaf Milkwort – *Polygala cruciata* var. *cruciata* – is coastal plain species with inland records along the Appalachian Plateaus and in midwestern prairie states. It is known from damp to wet meadows, yellow pine savannas, and bogs. On the DBNF, it is known from wet meadows and open, wet non-forested areas such as warm season grassland.

Gaywings – *Polygala pauciflora* – is a northern species with extend range through the southern Appalachians. It is found in rich moist forest. On the DBNF, one station is known from a mesic ravine in oak-hardwood forest.

Racemed Milkwort – *Polygala polygama* var. *polygama* – has a midwestern and coastal plain distribution. It is usually found on dry, sandy soil in open forest or grassland. The DBNF sites are on sandy soil in open, ridge top, yellow pine-oak forest or sandy, grassy openings.

Hairy Snout Bean – *Rhynchosia tomentosa* (var. *tomentosa*) – is found throughout most of the southeastern US. It grows in dry, open, often sandy, oak or yellow pine forest, at forest margins, in sandhills, and occasionally in mesic forest. The DBNF sites are all in warm season grassland, or low disturbed vegetation along roads or under powerline rights-of-way.

Short-stem Ragwort – *Senecio pauperculus* – is northern US and Canada species with range extensions southward along the Appalachian provinces. It is commonly found in bogs and wet meadows. On the DBNF, the species is found on boulder/cobble bars of Cumberland River drainage streams. In this habitat, moisture levels may be maintained, and habitat it maintained in an open condition.

Royal catchfly – *Silene regia* – is rare to uncommon throughout its range. It is found in warm season grasslands or in grassy areas of barrens. No extant populations of the species are present on the forest. There are historical records for it from the southern end of the forest. It requires open, high light conditions, and fire, in addition to maintaining habitat, probably also promotes the species.

Velvet Bush Pea – *Thermopsis mollis* (generic) – exists as two varieties, a piedmont variety, which is found in Kentucky, and a montaine variety. The latter occurs in dry-mesic forest on slopes and ridges.

Nettle-leaf Noseburn – *Tragia urticifolia* – is a prairie species with scattered stations eastward. It is commonly found in dry prairies and open (low tree density) rocky areas. It is known to Kentucky from only one site in the DBNF area. Here it occurs on a limestone glade above the Big South Fork River.

Narrow-leaved Bluecurls – *Trichostema setaceum* – is found on the coastal plain and the central Appalachians. It is found in dry sandy soils in open forest and fields. The DBNF records are from dry open oak forest and open grassland.

Running buffalo clover – *Trifolium stoloniferum* – inhabits open grassland, open woodland and the transition area between them. Light shade does not harm the plant. The species throughout its range is a calciphile, i.e., it shows a preference for limestone or otherwise base cation-rich soils. Periodic disturbance such as might have occurred while large ungulates passed through a population appears to benefit the plant. A large population in central Kentucky appears to do best with moderate disturbance from grazing/resting cattle. The sole population within the Daniel Boone NF proclamation boundary occurs in an open field.

New York Ironweed – *Vernonia noveboracensis* – is a coastal plain species with scattered interior stations. It is found in open floodplain forest, roadside ditches, marshes, and other wet places. On the DBNF, the species is found in streamhead wetlands and occasionally in roadside ditches. A canopy may be present, but if so, the midstory and shrub layers are sparse.

Bird's-foot violet – *Viola pedata* – occurs over most of the eastern US in dry, well-drained soils. On the Daniel Boone NF, it is most frequently encountered along sandy roadbanks and slopes in open yellow pine or yellow pine-oak forests. High light levels appear to be required by the species. The species also occurs in dry, upland pastures or grassy slopes that have thin vegetation.

Ferns

Engelmann's quillwort – *Isoetes engelmannii* – is a semi-aquatic species. The plants can survive entirely submerged, or for several months out of water if the soil remains moist. At the time spores are released, the leaf bases must be submerged for sexual reproduction to be successful. The plants are generally in shallow water (under 2 feet deep) and are found in both permanent and seasonal water including ruts, roadside ditches, ponds, lake margins, and occasionally in streamhead wetlands and streams.

Gymnosperms

Eastern redcedar – *Juniperus virginiana* – is known from eastern and central North America. It is abundant in some areas, and often dominant on old fields, especially those on basic substrates. In Kentucky, it is widespread and not rare, but in most cases, it occurs as a pioneer species following extensive, and often long-term disturbance. On the Forest, most eastern redcedar occurs in more natural situations along dry limestone cliffs and flats, and rocky flats, and on dry, rocky siltstone flats. In this habitat, the species is uncommon to rare on the DBNF, and it is here that concerns for the species exist.

Monocots

Grass-pink – *Calopogon tuberosus* – is a coastal plain species found in wet to moist pine savannas, roadside ditches, pitcher plant bogs, and other open, wetland habitats. A few historic Kentucky stations occurred in dry, sandy soil on ridgetops under open oak or oak-yellow pine forest. On the DBNF, a few extant stations are known from streamhead wetlands, slope seeps or wet warm season grassland. It may have occurred on drier sites in the past. The species requires constant moisture and more or less open conditions.

Streamside carex sedge – *Carex emoryi* – grows in open gravel bars and occasionally mud banks along medium to large streams. The plants grow in thick bands along the stream and are frequently standing in a few inches of water. The bars are subject to scouring during flooding events, which keeps the bars open. The species appears to require constant water and high light.

Upright caric sedge – *Carex stricta* – is similar to and easily confused with streamside caric sedge. Its range is primarily the northern US, but with extensions into the Appalachian Mountains. This species may grow along streamsides in gravel or mud bars subjected to flooding, but is more commonly found in swamps. It forms tight clumps, which are usually in several inches of standing water. The water is often stagnant. The canopy provides moderate to heavy shade. The DBNF stations are in swamps.

Appalachian Spreading Pogonia – *Cleistes bifaria* – ranges from the Appalachian Plateaus to the Piedmont. It is found in a variety of sites ranging from glades to open forest to warm season grassland to streamhead wetlands. It occurs on well-drained substrates (on hummocks in wetlands) usually in open or partially open conditions. The plants can be single or occur in colonies. On the DBNF, it is known from glades, streamhead wetlands, seep slopes, and on road cuts in upland oak forest. Fire enhances flowering and total numbers of plants. Fire probably helps to maintain habitat as well.

Wild yam – *Dioscorea villosa* – is a widespread species, occurring in a variety of wooded habitats throughout its range. It occurs as single plants or in small clumps. It appears to be at least a weak calciphile. On the DBNF, it is most frequent in dryish forest, under moderate to light shade. The tuber produced by the plant is collected for medicinal purposes.

Wood Lily – *Lilium philadelphicum* var. *philadelphicum* – occurs from New England to NC and Kentucky. It is found in open, usually dry forest or in open fields or warm season grass areas. On the DBNF, it is known from open yellow pine-oak forest, roadsides, warm season grassland, and old fields. It requires open conditions and is soon choked out by heavy cover of herbaceous or woody species. Fire maintains its habitat and promotes the plant.

Loesel's Twayblade – *Liparis loeselii* – is a northern and midwestern North American species. It is found in wet to damp forest. On the DBNF, it is known from wet seeps on roadsides, a seep at the base of an abandoned limestone quarry, and at the edge of a strip mine pond.

Plains Muhlygrass – *Muhlenbergia cuspidate* – is a prairie species with disjunct populations in Kentucky. It grows in prairies or other open grassland on dry, usually gravelly or rocky soil. On the DBNF, the few locations occur on limestone in open glade areas.

Yellow crested orchid – *Platanthera cristata* – occurs in a wide variety of habitats across its range. On the DBNF, it occurs in streamhead wetlands, seeps, and in permanently damp to wet areas in warm season grassland. It occurs in low to moderate shade

conditions. This species is an alternative host to an endophyte fungus that is the sole fungal associate for white fringeless orchid (*P. integrilabia*). Maintaining this orchid helps to maintain a diverse stock for the fungal symbiont.

Small Purple-fringed Orchid – *Platanthera psycodes* – is a northern species with a range extension south along the Appalachian Mountains. It is found in wet meadows and wet, open forest. On the DBNF, there are tentative records for this species from wet stream terraces under high canopy closed forest. The identity of the plants in question is not certain.

Globe Beaked-rush – *Rhynchospora globularis* var. *globularis* – is a coastal plain species with stations in the interior. It commonly occurs on wet sand and in swamps and bogs, either in the open or under open canopy. The DBNF populations occur in wet open, usually sandy areas in warm season grassland or disturbed ground.

Slender Marsh-pink – *Sabatia campanulata* – is coastal plain species found in salt or brackish marshes. It occurs inland in a few areas. The DBNF sites are from wet meadows.

Shining Ladies'-tresses – *Spiranthes lucida* – is a northeastern to central US species. It is commonly found in damp forest and marshes, and on wet shores. On the DBNF, the species at all sites is found on open limestone streambanks, often in thin mud.

Great Plains Ladies'-tresses – *Spiranthes magnicamporum* – was erroneously reported from the DBNF and the species carried on a conservation species list for several years. It is unlikely that this species occurs on the Forest, although a few areas, e.g., Clack Mountain, with apparently suitable habitat exist.

Rough Dropseed – *Sporobolus clandestinus* – is tall grass prairie species, which also occurs on the coastal plain. It is found in dry sandy soil of prairies, openings, barrens, and along roadways and other rights-of-way. On the DBNF, the species is found in McCreary and Pulaski Counties on limestone cliffs and open, sandy yellow pine or yellow pine-oak forest.

Mosses

Cataract Metal Moss – *Scopelophila cataractae* – is found in isolated populations in the Appalachians and a few western states within the US. It is known from thin soil over rock and from a roadcut near a stream. In Kentucky, it is known from one site (Wolfe County) in the Red River Gorge on the DBNF. It was found in a sandstone rockhouse, most likely in a shaded, damp location.

References:

Baker, M.D. and Michael J. Lacki. 1997. Short-term changes in bird communities in response to silvicultural prescriptions. *Forest Ecol. and Manag.* 96: 27-36.

- Barbour R.W. 1971. Amphibians and reptiles of Kentucky. The University Press of Kentucky. Lexington, KY.
- Barbour, R.W., C.T. Peterson, D. Rust, H.E. Shadowen and A.L. Whit. 1973. Kentucky birds-a finding guide. The University Press of Kentucky. Lexington, KY. 305 pp.
- Behler, J.L. and F.W. King. 1979. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York.
- Conant, R. and J.T. Collins. 1991. Peterson field guide to reptiles and amphibians: eastern and central North America. 3rd ed. Houghton
- Hamel, Paul B. 1992. Land manager's guide to birds of the South. The Nature Conservancy, Southeastern Region. Chapel Hill, NC. 437 pp.
- Martof, B.S., W.M. Palmer, J.R. Bailey, and J.R. Harrison, Jr. 1980. Amphibians and reptiles of the Carolinas and Virginia. Univ. of North Carolina Press. Chapel Hill, NC. 264 pp.
- Mengel, R.M. 1965. The birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press. Lawrence, KS. 581 pp.
- Mifflin, Boston.DeGraaf R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and rangeland birds of the United States: natural history and habitat use. USDA Agriculture Handbook 688. 625 pp.
- NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Arlington, Virginia, USA: Association for Biodiversity Information. Available: <http://www.natureserve.org/>.
- Palmer-Ball, B.L. 1996. The Kentucky breeding bird atlas. The University Press of Kentucky. Lexington, KY. 372 pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.
- VA Department of Game and Inland Fisheries: VA Fish and Wildlife Information Service. 2001. Available: <http://www.dgif.state.va.us/>. Accessed July 26, 2001.
- Wilson, L.A. 1995. Land manager's guide to the amphibians and reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and The U.S. Forest Service, Southern Region. Atlanta GA.

07/15/2003

Attachment C.

Grassland Species/Habitat Relationships with References

Association	Habitats	Modifier	Class	Common/Species
11-Grasslands	Cool Season Grassland	(blank)	BIRD	Common Yellowthroat/ <i>Geothlypis trichas</i>
				Chipping Sparrow/ <i>Spizella passerina</i>
				Field Sparrow/ <i>Spizella pusilla</i>
				Henslow's Sparrow/ <i>Ammodramus henslowii</i>
		Forb/Grass Condition		Grasshopper Sparrow/ <i>Ammodramus savannarum</i>
				Northern Bobwhite/ <i>Colinus virginianus</i>
		Low (wet, i.e. subject to holding water)		Sedge Wren/ <i>Cistothorus platensis</i>
		Moist		Henslow's Sparrow/ <i>Ammodramus henslowii</i>
				Sedge Wren/ <i>Cistothorus platensis</i>
				Common Yellowthroat/ <i>Geothlypis trichas</i>
			P-DIC	Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>
				Yellow Gentian/ <i>Gentiana alba</i>
				Vetchling Peavine/ <i>Lathyrus palustris</i>
		Open (Little or No Shade)	BIRD	Gray Catbird/ <i>Dumetella carolinensis</i>
				Common Yellowthroat/ <i>Geothlypis trichas</i>
				Field Sparrow/ <i>Spizella pusilla</i>
	Cropland			Northern Bobwhite/ <i>Colinus virginianus</i>
		Rich Soil		American Woodcock/ <i>Scolopax minor</i>
		Seep/Constant Water	P-MON	Yellow-crested Orchid/ <i>Platanthera cristata</i>
	Meadows (native species predominate)	(blank)	AMPHI	Green Frog/ <i>Rana clamitans</i>
			BIRD	Common Yellowthroat/ <i>Geothlypis trichas</i>
			INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>
				Diana Fritillary/ <i>Speyeria diana</i>
				Regal Fritillary/ <i>Speyeria idalia</i>
			P-DIC	Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>
			P-MON	Grass-pink/ <i>Calopogon tuberosus</i>
		Acidic Substrate	P-DIC	Nuttall's Lobelia/ <i>Lobelia nuttallii</i>
		Forb/Grass Condition	BIRD	Henslow's Sparrow/ <i>Ammodramus henslowii</i>
				Whip-poor-will/ <i>Caprimulgus vociferus</i>
				Northern Bobwhite/ <i>Colinus virginianus</i>
				Sedge Wren/ <i>Cistothorus platensis</i>
			INSEC	Regal Fritillary/ <i>Speyeria idalia</i>
			P-DIC	Nuttall's Lobelia/ <i>Lobelia nuttallii</i>
		Moist	BIRD	Henslow's Sparrow/ <i>Ammodramus henslowii</i>
				Sedge Wren/ <i>Cistothorus platensis</i>
				Common Yellowthroat/ <i>Geothlypis trichas</i>

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
			P-DIC	Brook Saxifrage/ Boykinia acontifolia
				Scarlet Indian Paintbrush/ Castilleja coccinea
				Slender Marsh-pink/ Sabatia campanulata
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
		Open (Little or No Shade)	BIRD	Gray Catbird/ Dumetella carolinensis
				Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
				Field Sparrow/ Spizella pusilla
			P-DIC	Nuttall's Lobelia/ Lobelia nuttallii
		Rich Soil	P-DIC	Fraser's Loosestrife/ Lysimachia fraseri
	Old Field	(blank)	BIRD	Eastern Towhee/ Pipilo erythrophthalmus
				Field Sparrow/ Spizella pusilla
			INSEC	Diana Fritillary/ Speyeria diana
			P-DIC	Running Serviceberry/ Amelanchier stolonifera
				Nettle-leaf Noseburn/ Tragia urticifolia
			P-GYM	Eastern Redcedar/ Juniperus virginiana var. virginiana
			REPT	Corn Snake/ Elaphe gutta gutta
		Burrows, Holes, Tunnels (Secondary Users)		Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Dense shrub understory	BIRD	Gray Catbird/ Dumetella carolinensis
		Dry	P-DIC	Narrow-leaved Bluecurls/ Trichostema setaceum
				Bird's-foot Violet/ Viola pedata
			P-MON	Wood Lily/ Lilium philadelphicum var. philidelphicum
			REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Elevation (above 2300 ft)	BIRD	Chestnut-sided warbler/ Dendroica pensylvanica
				Golden-winged warbler/ Vermivora chrysoptera
			P-MON	Wood Lily/ Lilium philadelphicum var. philidelphicum
		Forb/Grass Condition	BIRD	Bachman's Sparrow/ Aimophila aestivalis
				Henslow's Sparrow/ Ammodramus henslowii
				Whip-poor-will/ Caprimulgus vociferus
				Northern Bobwhite/ Colinus virginianus
			MAMM	Virgina Big-eared Bat/ Plecotus townsendii virginianus
		Low (wet, i.e. subject to holding water)	BIRD	Sedge Wren/ Cistothorus platensis
		Moist	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Sedge Wren/ Cistothorus platensis
				Gray Catbird/ Dumetella carolinensis
				American Woodcock/ Scolopax minor
			P-DIC	Barbara's Buttons/ Marshallia grandiflora
				New York Ironweed/ Vernonia noveboracensis
			P-MON	Shining Ladies'-tresses/ Spiranthes lucida
		Open (Little or No Shade)	BIRD	Gray Catbird/ Dumetella carolinensis
				Common Yellowthroat/ Geothlypis trichas
				Field Sparrow/ Spizella pusilla

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
			P-DIC	American Cow-wheat/ <i>Melampyrum lineare</i> var. <i>lineare</i>
				Small Sundrops/ <i>Oenothera perennis</i>
				Velvet Bush Pea/ <i>Thermopsis mollis</i> (generic)
				Bird's-foot Violet/ <i>Viola pedata</i>
		Riparian		White-leaf Leather-flower/ <i>Clematis glaucophylla</i>
				New York Ironweed/ <i>Vernonia noveboracensis</i>
		Rocky/Rocks	REPT	Eastern Earth Snake/ <i>Virginia valeriae valeriae</i>
		Sandy Soil	P-DIC	American Gromwell/ <i>Lithospermum latifolium</i>
				Narrow-leaved Bluecurls/ <i>Trichostema setaceum</i>
				Bird's-foot Violet/ <i>Viola pedata</i>
		Seep/Constant Water		Short-stem Ragwort/ <i>Senecio pauperculus</i>
			P-MON	Carex Sedge/ <i>Carex emoryi</i>
				Uptight Caric Sedge/ <i>Carex stricta</i>
				Loesel's Twayblade/ <i>Liparis loeselii</i>
				Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
		Shrub/Sapling Condition	BIRD	Prairie warbler/ <i>Dendroica discolor</i>
				Common Yellowthroat/ <i>Geothlypis trichas</i>
				Yellow-breasted Chat/ <i>Icteria virens</i>
				Bewick's Wren/ <i>Thryomanes bewickii altus</i>
				Golden-winged warbler/ <i>Vermivora chrysoptera</i>
		Tract Size (Area Sensitive)		American Woodcock/ <i>Scolopax minor</i>
		Tree and Snags (Cavity Nesters)		Bewick's Wren/ <i>Thryomanes bewickii altus</i>
		Upland (usually mesic to dry, not subject to holding water)	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
	Pasture (general, unspecified)	(blank)	BIRD	Henslow's Sparrow/ <i>Ammodramus henslowii</i>
			INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>
				Diana Fritillary/ <i>Speyeria diana</i>
				Regal Fritillary/ <i>Speyeria idalia</i>
			P-DIC	Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>
				American Gromwell/ <i>Lithospermum latifolium</i>
			P-MON	Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
		Burrows, Holes, Tunnels (Secondary Users)	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
		Drainage Good		Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
		Dry		Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
		Forb/Grass Condition	BIRD	Henslow's Sparrow/ <i>Ammodramus henslowii</i>
				Grasshopper Sparrow/ <i>Ammodramus savannarum</i>
				Whip-poor-will/ <i>Caprimulgus vociferus</i>
				Northern Harrier/ <i>Circus cyaneus</i>
				Northern Bobwhite/ <i>Colinus virginianus</i>
		Leaf Litter	REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus</i>

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				longicaudus
		Low (wet, i.e. subject to holding water)	BIRD	Sedge Wren/ Cistothorus platensis
			INSEC	Regal Fritillary/ Speyeria idalia
		Moist	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Sedge Wren/ Cistothorus platensis
			P-DIC	New York Ironweed/ Vernonia noveboracensis
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
		Open (Little or No Shade)	BIRD	Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
				Field Sparrow/ Spizella pusilla
		Riparian	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Sandy Soil	P-DIC	Sweet-fern/ Comptonia peregrina
		Seep/Constant Water		Cross-leaf Milkwort/ Polygala cruciata var. cruciata
		Upland (usually mesic to dry, not subject to holding water)	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Water (Distance Sensitive)		Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
	Ruderal/Waste Areas	(blank)	INSEC	Diana Fritillary/ Speyeria diana
			P-DIC	Scarlet Indian Paintbrush/ Castilleja coccinea
				St. Peter's-wort/ Hypericum crux-andreae
				Mountain Lover/ Paxistima canbyi
		Acidic Substrate		Racemed Milkwort/ Polygala polygama var. polygama
		Elevation (above 2300 ft)	P-MOS	Cataract Metal Moss/ Scopelophila cataractae
		Moist	P-DIC	New York Ironweed/ Vernonia noveboracensis
		Open (Little or No Shade)	P-DIC	Yucca-leaved Rattlesnake Master/ Eryngium yuccifolium
				Fraser's Loosestrife/ Lysimachia fraseri
				Racemed Milkwort/ Polygala polygama var. polygama
			P-MON	Wild Yam/ Dioscorea villosa
		Rocky/Rocks	P-MOS	Cataract Metal Moss/ Scopelophila cataractae
		Sandy Soil	P-DIC	Sweet-fern/ Comptonia peregrina
				American Gromwell/ Lithospermum latifolium
		Seep/Constant Water	P-FER	Quillwort/ Isoetes englemannii
			P-MON	Globe Beaked-rush/ Rhynchospora globularis var. globularis
	Sericea-Fescue Grassland	(blank)	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Chipping Sparrow/ Spizella passerina
				Field Sparrow/ Spizella pusilla
		Forb/Grass Condition		Henslow's Sparrow/ Ammodramus henslowii
				Grasshopper Sparrow/ Ammodramus savannarum
				Northern Bobwhite/ Colinus virginianus
		Low (wet, i.e. subject to holding water)		Northern Harrier/ Circus cyaneus

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Sedge Wren/ Cistothorus platensis
		Moist		Henslow's Sparrow/ Ammodramus henslowii
				Sedge Wren/ Cistothorus platensis
		Open (Little or No Shade)		Northern Harrier/ Circus cyaneus
				Gray Catbird/ Dumetella carolinensis
				Common Yellowthroat/ Geothlypis trichas
				Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
		Snags > 6" dbh	BIRD	Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
	Warm Season Grassland	(blank)		Common Yellowthroat/ Geothlypis trichas
				Chipping Sparrow/ Spizella passerina
				Field Sparrow/ Spizella pusilla
			INSEC	Diana Fritillary/ Speyeria diana
				Regal Fritillary/ Speyeria idalia
			P-DIC	Royal Catchfly/ Silene regia
				Running Buffalo Clover/ Trifolium stoloniferum
			P-MON	Plains Muhlygrass/ Muhlenbergia cuspidata
		Acidic Substrate	P-DIC	Yucca-leaved Rattlesnake Master/ Eryngium yuccifolium
				Yellow Gentian/ Gentiana alba
			P-MON	Grass-pink/ Calopogon tuberosus
		Basic Substrate		Great Plains Ladies'-tresses/ Spiranthes magnicamporum
		Burrows, Holes, Tunnels (Secondary Users)	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Drainage Good	INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
				Regal Fritillary/ Speyeria idalia
			REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Drainage Poor	INSEC	Regal Fritillary/ Speyeria idalia
		Dry	P-DIC	Thread-leaf Sundrops/ Oenothera linifolia
			P-MON	Great Plains Ladies'-tresses/ Spiranthes magnicamporum
				Rough Dropseed/ Sporobolus clandestinus
		Elevation (above 2300 ft)	INSEC	Regal Fritillary/ Speyeria idalia
		Fire Tolerant/Enhanced		Appalachian Grizzled Skipper/ Pyrgus wyandot
				Diana Fritillary/ Speyeria diana
				Regal Fritillary/ Speyeria idalia
			P-DIC	Hairy Snout Bean/ Rhynchosia tomentosa
		Forb/Grass Condition	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Grasshopper Sparrow/ Ammodramus savannarum
				Northern Bobwhite/ Colinus virginianus
		Leaf Litter	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Moist	BIRD	Henslow's Sparrow/ Ammodramus henslowii
				Common Yellowthroat/ Geothlypis trichas
			INSEC	Regal Fritillary/ Speyeria idalia
			P-DIC	Scarlet Indian Paintbrush/ Castilleja coccinea

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Yucca-leaved Rattlesnake Master/ Eryngium yuccifolium
			P-MON	Grass-pink/ Calopogon tuberosus
				Appalachian Spreading Pogonia/ Cleistes bifaria
		Open (Little or No Shade)	BIRD	Gray Catbird/ Dumetella carolinensis
				Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
				Field Sparrow/ Spizella pusilla
			INSEC	Regal Fritillary/ Speyeria idalia
			P-MON	Wood Lily/ Lilium philadelphicum var. philadelphicum
		Riparian	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Rocky/Rocks	P-DIC	Prairie Redroot/ Ceanothus herbaceus
			P-MON	Rough Dropseed/ Sporobolus clandestinus
		Sandy Soil	INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
				Regal Fritillary/ Speyeria idalia
			P-MON	Rough Dropseed/ Sporobolus clandestinus
		Shrub/Sapling Condition	BIRD	Bachman's Sparrow/ Aimophila aestivalis
		Snags > 6" dbh		Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
		Water (Distance Sensitive)	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
	Wet Fields	(blank)	BIRD	Gray Catbird/ Dumetella carolinensis
				Common Yellowthroat/ Geothlypis trichas
			INSEC	Regal Fritillary/ Speyeria idalia
			P-DIC	Vetchling Peavine/ Lathyrus palustris
		Dense shrub understory	BIRD	Gray Catbird/ Dumetella carolinensis
		Forb/Grass Condition		Henslow's Sparrow/ Ammodramus henslowii
				Northern Bobwhite/ Colinus virginianus
			P-MON	Yellow-crested Orchid/ Platanthera cristata
		Low (wet, i.e. subject to holding water)	BIRD	Sedge Wren/ Cistothorus platensis
			INSEC	Diana Fritillary/ Speyeria diana
		Moist	BIRD	Sedge Wren/ Cistothorus platensis
		Open (Little or No Shade)		Least flycatcher/ Empidonax minimus
				Migrant Loggerhead Shrike/ Lanius ludovicianus migrans
		Rich Soil		American Woodcock/ Scolopax minor
		Shrub/Sapling Condition		Prairie warbler/ Dendroica discolor
				Least flycatcher/ Empidonax minimus
		Snags > 6" dbh		Migrant Loggerhead Shrike/ Lanius ludovicianus migrans

Viability Assessment Report For General Forest Habitat Association

Prepared by
Timothy O. Reed
Daniel Boone National Forest

I. Description of Habitat Association

The General Forest Habitat Association encompasses a wide range of forest conditions and can potentially include any soil, forest type, or land type association (LTA) which occurs on the Daniel Boone National Forest (DBNF) (see USDA Forest Service, 1997a). Forested terrain ranges from hilly to rugged in the Cumberland Plateau, which encompasses most of the DBNF and is intersected by cliffs in the higher elevations and by drainages of the Cumberland, Kentucky and Licking Rivers at lower elevations. Steepest terrain occurs in the Cumberland Mountains, which border the southeastern section of the DBNF. This habitat association includes both hardwood and pine trees, as well as stands that are a mixture of both, along with their associated plant and animal species. Hardwood predominates on all districts, with pine more abundant on the southern half of the DBNF (the London, Somerset, and Stearns Districts).

Because this is a broad and encompassing habitat association, general forest might best be described as the typical forest scene that comes to mind when one thinks about being out in woods within the DBNF. Many events may have shaped this forest scene including disturbance from storm events, natural tree mortality, wildfires, insect and disease mortality and natural succession. Management activities have also impacted this scene through timber harvest, prescribed burning, timber stand improvement treatments, trails and recreation developments, mineral extraction, and wildlife habitat improvement activities. This is an association in which species are found that utilize a wide range of general forested conditions. These species may be dependant on specific habitat attributes or modifiers, such as: proximity to water sources; soil moisture; stand age; density of forest canopy, midstory, and/or understory with corresponding degrees of exposure to sunlight; etc. but generally they show no preference for one forest type over another. Species that occur in this association fall into at least one of three categories: 1) they tolerate a wide variety of forest types and are primarily general forest dwellers; 2) they have very specific requirements (e.g. early successional habitat) but dwell in a variety of forest types when the modifier is present; 3) they have certain specific requirements not met within this broad association at all times, but do occur in general forest situations at least some of the time (e.g. when foraging).

II. Current Status of Habitat Association on the Daniel Boone National Forest

The DBNF has approximately 664,984 acres of general forestland (USDA Forest Service, 1998), a figure that has increased over the previous planning period as a result of land acquisition. The General Forest Habitat Association is comprised of all the DBNF acres

considered forested. This represents the total DBNF ownership minus non-forested acres such as surface water, road and utility corridors, permanent openings and non-forested strip mines. It is composed primarily of hardwood stands, which make up about 70 percent (466,135 ac) of the total acreage. Pine stands comprise approximately 10 percent (68,681 ac) of the Forest. Mixed forest types account for the remaining 20 percent, which is fairly evenly divided between pine-hardwood (61,203 ac) and hardwood-pine (68,965 ac) stands. The DBNF is in the process of undergoing a significant change in composition, particularly in the southern half of the Forest, as a result of the Southern Pine Beetle infestations. Since the infestations' began in 1999-2000, tremendous yellow pine mortality has occurred. The estimates of predicted pine loss resulting from the beetle epidemic run as high as 75 - 90 percent. This has resulted in many of the pine and mixed pine/hardwood stands to become increasingly dominated by the hardwood groups.

Table 1. General Forest Age Class Distribution

Age Class	Acreage	Percent
0-10	51,441	8
11-20	46,818	7
21-30	43,664	7
31-40	35,211	5
41-50	26,853	4
51-60	41,984	6
61-70	88,041	13
71-80	98,094	15
81-90	93,279	14
91-100	75,169	11
101-110	41,855	6
111-120	13,883	2
121-130	4,481	1
131-140	1,578	< 1
141-150+	2,633	< 1

Four age classes within the Continuous Inventory of Stand Conditions (CISC) data show significantly higher percentages of the total acreage than other individual age classes. These classes indicate that approximately 53 percent (354,583 ac) of the total forested area is in stands of trees between 61 and 100 years of age (USDA Forest Service, 1998), an increase from 45 percent in 1980 (USDA Forest Service, 1985). About 25 percent (168,448 ac) of the total forested acreage is between 81 and 100 years of age, compared with 16 percent in 1980. Approximately 35 percent (232,878 ac) of the total acreage is in stands that are 81 years of age and older, compared with about 21 percent in 1980. The percentage of stands that are 100 years of age and older has risen from about 5 percent in 1980 to nearly 10 percent (64,430 ac). These older age classes provide attributes such as large trees, decadent trees with natural cavities and more open mid and understory conditions.

At the other end of the age class spectrum, early-successional conditions occur within the 0-10 year age class. For some species, suitable conditions may continue beyond ten years; whereas for others, advancing succession, the increased growth of saplings, and/or denser understory may be prohibitive as soon as 3 – 4 years. On the DBNF, approximately 8 percent (51,441 ac) of the total forested acreage falls within the 1-10 year age class, compared with about 9 percent in 1980. [Note that these figures represent early-successional conditions within forested stands; grassy-type openings and fields are addressed separately under the Grassland Habitat Association.] The slight decline is likely the result of the recent halt in new timber harvests, as timber harvesting initially results in the creation of early-successional conditions.

Approximately 7 percent of the total forested acreage is within each of the classes that generally correspond to the sapling/pole condition: the 11-20 year (46,818 ac) and 21-30 year (43,664 ac) age classes. By comparison, 8 percent and 4 percent of forested acreage occurred, respectively, in those classes in 1980. The age that corresponds to the change from sapling/pole to mid-age conditions varies between tree species and sites. Likewise, the cut-off for mid-age is variable--Although Virginia Pine is considered mature when it reaches 60 years of age, for other species the mid-age period will extend to 70 years or longer. But for the sake of comparison, the percentage of trees currently between 31 and 60 years old is about 16 percent (104,048 ac), down from approximately 28 percent in 1980.

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

Species associated with the general forest habitat are dependant on a forested condition and usually one or more specific attributes, or modifiers, of the general forest. Because the species linked to this habitat association are typically indifferent to dominate forest cover type (e.g. pine vs. hardwood vs. mixed), the specific modifiers become the element that determines the ability of this association to provide for a high probability of persistence for the associated species.

In order to provide for all the specific attributes necessary to sustain species, it is important that the general forest contain a variety of successional conditions. The general forest should contain early successional, sapling/pole, mid-age, mature and old-growth conditions. These conditions should be distributed in the various forest types found within this association. The exact distribution of age class will be influenced by several other factors. Distribution may be due to the species need for continuity of certain age classes and other factors that result from management of more specific associations that also fall under the broad scope of general forest. Other modifiers that can be affected by management activities will be provided for within the various age classes of general forest.

The early successional age class generally provides in the first 0-3 years, a forb and low shrub and/or short tree sprout dominated forest. Forbs, and some grasses provide for a short time, a condition similar to, but not the same as a grass or forbs opening, including forage, nectar flowers, and an open condition. Woody plant heights are generally less than 3-4 feet in this period. Generally between 3 and 10 years, woody vegetation begins rapid growth, filling in and choking out the herbaceous plants. The trees and shrubs also grow taller,

reaching 7 – 15 feet depending on the site. This condition provides a dense shrub like cover in the open, providing hiding and nest sites for many species.

Generally, forests from 11 to 30 years provide the sapling/pole stage of forest succession. This stage typically contains high woody stem density from 11 to 20 years and gradually begins to thin as it approaches 30 years due to the shading of more dominant overstory development. Trees may reach a diameter of 8 to 10 inches diameter at breast height (DBH) near the 30-year mark depending on species and site conditions. There is typically a well-developed shrub layer present during this stage but it is usually reduced in the latter years of this stage.

Mid age forest typically encompasses forests that are 30 to 80 years old. This stage contains trees greater than 10 inch DBH and typically has a well-shaded understory unless the area is being managed for sparse overstory conditions such as with prescribed fire. During this stage mast-producing species will typically begin to produce and snags and natural cavities will occur sporadically.

Mature to old growth stages are typically greater than 80 years old. Old growth conditions are usually related to species composition. Generally, shortleaf pine dominated forests are considered old growth after 100 years while mixed mesophytic forest are not considered old growth until 140 years (USDA Forest Service, 1997). The mature and old growth conditions typically provide larger trees, more open understory and higher numbers of snags and natural cavities. There is also usually more downed wood in the older stage of forest succession. Small canopy openings that result from downed large trees may occur throughout this stage.

The following recommendations will ensure that this association provides for the habitat conditions necessary to ensure a high probability of persistence for the species dependant on the General Forest Habitat Association. These are considered to be the items that will potentially have the most impact on the species group within the general forest association.

A. Existing Forest Plan Goals, General Direction and Standards & Guides (Forest-Wide)

- Forest Goals - # 3, 6, 8, 15, 16, 21, 22, 25 and 26 (USDA Forest Service, 1985- pp IV2 & IV3).
 - *Rationale: These goals place emphasis on the management of the general forest in a manner that will provide suitable habitat and habitat attributes necessary to allow associated species to persist on the forest. These goals should be carried into new plan revision, as they are applicable to the viability of species in the General Forest Habitat Association.*
- Management of mixed forest types (USDA 1985, amend. 6, pp 2 – 6)
 - *Rationale: This direction allows for the use of mixed management types within the general forest. This will allow for a more diverse forest that will help to ensure the persistence of the diverse species group associated with the general forest habitat association. Elements of this amendment will likely need to be adjusted to*

meet the requirements of other, more specific habitat associations. The intent here is to stress that this form of management needs to continue to some degree in the general forest.

B. Additional Recommendations

- Incorporate guidance found within “An Assessment and Strategy for Conservation of Aquatic Resources on the DBNF, Interim Report, April 2001” as direction for management activities which take place in terrestrial environments.
 - *Rationale: The guidance within this assessment represents the best science available for the management of riparian areas within the forest. This will help ensure that species associated with the general forest that require riparian areas as a modifier have a high probability of persistence on the forest. This direction is particularly important to several plant species that require the riparian area as a habitat modifier.*
- Maintain a variety of forest types to ensure adequate diversity and provide for habitat modifiers to support species group.
 - *Rationale: Where this composition occurs will be determined by site conditions and other species-specific management needs. Maintaining a variety of forest types and mixed conditions ensures a diverse habitat capable of sustaining species.*
- Maintain a distribution of age classes to provide for habitat modifiers related to various stages of succession.
 - *Rationale: Many of the species in this association group are specific to a particular stage of forest succession rather than forest cover type. The key point is to ensure a flow of the various age classes to cover the stages that include early successional, shrub/sapling, mid-age forest, mature forest and old growth. By providing these stages the habitat modifiers required by the species group will likely be present.*
- Maintain spatial arrangement of age class distribution to provide for continuity of age class habitat modifiers for species requiring minimum tract size.
 - *Rationale: A spatial arrangement of age classes that allows for contiguous older age habitat of 2500 acre blocks is important to some bird species in this habitat association. Blocks of this size should be provided for in the 80+ age class and distributed over the planning area.*
- Maintain distribution of younger age classes to provide for edge and early successional habitat modifiers.
 - *Rationale: Several species utilize the edge condition created by the juxtaposition of different age classes. This habitat will be provided for by the distribution of*

regeneration areas among older age classes. Regeneration areas should be small (10 – 40 acres) and interspersed in areas with stands at least 30 years old. Specific management emphasis, such as for Ruffed Grouse, may favor adjacent stands younger than 30 yrs.

- Focus land acquisition plans on areas of higher elevation forest habitat and areas to provide for contiguous blocks of mature habitat for species with viability concerns.
 - *Rationale: Some species in this association require higher elevation forest areas (2000 ft. +). This habitat is extremely limited within the DBNF proclamation boundary and should be considered a high priority for acquisition. Species that require large tracts and forest interior conditions would benefit from consolidation of land ownership that provides these conditions.*

C. Species Specific General Direction and Standards and Guidelines for the Indiana Bat

Protect, maintain and enhance Indiana bat roosting, foraging and maternity habitat in the general forest area. (Unless otherwise noted, the standards and guidelines are current Forest Plan direction.)

- Tree cutting activities, involving currently suitable or potential roost trees, will not be conducted within two and one half miles of an Indiana bat maternity colony between 1 May and 15 August.
 - *Rationale: Female Indiana bats frequently forage up to 2 ½ miles from their maternity colony site. Tree cutting activity in this area during the maternity period decreases their chance to successfully raise their young. (USFWS current best available knowledge)*
- Generally, currently suitable roost trees which are 6" or greater dbh (SHNS EA, Chapter VII) may be removed between 15 October and 31 March if they are greater than five miles from a significant hibernaculum and outside known Karst areas. If removal occurs at other times, trees must be evaluated for bat use by a trained observer immediately prior to tree removal.
 - *Rationale: During the 15 October to 31 March time period Indiana bats are either in hibernation or are concentrated in forest areas near hibernation caves, therefore they will not be routinely roosting under the bark of trees outside the five mile zone. At other times of the year Indiana bats may be utilizing currently suitable roost trees throughout the DBNF.*
- RCW midstory work within the HMA may remove all currently suitable roost trees less than 9" dbh between 1 Dec and 15 March. Outside this time period currently suitable roost trees are to be girdled and left standing.
 - *Rationale: Maintaining an open understory condition is important to RCW habitat management. To avoid conflict with roosting Indiana bats, currently*

suitable roost trees should not be cut down between 16 March and 30 November. Rather these trees will be killed, but left standing thereby providing Indiana bat roost trees and also maintaining open understory conditions desirable to the RCW.

- Every effort will be made to retain existing snags within project areas except where they would interfere with the project purpose and need.
 - *Rationale: Snags provide important habitat conditions for roosting Indiana bats and should be retained if at all possible within project areas. Snags should not be intentionally felled in these areas. It is also recognized that the purpose and need of some projects will preclude leaving any snags within the immediate project area.*
- Snags that are considered to be an immediate threat to human safety may be removed at any time.
 - *Rationale: While it is recognized that the removal could occur during the Indiana bat roosting season, the safety of humans is of paramount importance.*
- Snags identified as hazards but not immediate threats to human safety will only be removed during the hibernation season (December 1 - March 31 if within 5 miles of a hibernation site and between 15 October and 31 March if outside the 5 mile zone).
 - *Rationale: Snags within project areas that are designated for removal should be removed at a time when this activity does not present a threat to roosting Indiana bats.*
- Some snags may be removed as incidental loss associated with project activities such as skid trails, log landings and roads, etc. The accidental felling of a snag, that is 9 inches or greater dbh, is reportable to the Forest T&E biologist and the USFWS.
 - *Rationale: It is recognized that some inadvertent loss of snags will occur. The accidental felling a snag 9 inches or greater dbh is by definition not part of the analysis of the proposed action. Thus, these trees should be reported, as described above, in order to fully determine annual effects on the Indiana bat roosting/foraging habitat.*
- Prescribed burning will not occur in areas of Indiana bat roosting habitat between 1 May and 15 August.
 - *Rationale: During the maternity season non-volant juvenile Indiana bats roosting under tree bark or in snags may be killed by the heat or smoke associated with prescribed fire. (USFWS current best available knowledge)*

Maintain and enhance roosting and foraging habitat during projects designed to manage overstory vegetation. (Unless otherwise noted, the standards and guidelines are current Forest Plan direction.)

- No snags will be intentionally felled within project areas associated with timber management. Within these areas at least three snags per acre need to be over 9 inches in dbh.
 - *Rationale: Snags are important as Indiana bat roosting habitat and should be retained in timber sale areas.*
- Live trees within a regeneration project area will be girdled if the existing density of standing dead trees does not meet the three per acre standard.
 - *Rationale: If the area does not contain at least three, 9 inch dbh or greater snag per acre, additional trees will be killed to provide this needed habitat component.*
- Retain live trees adjacent to 1/3 of all snags over 12 inches dbh to provide partial shading.
 - *Rationale: A variety of microclimate conditions are needed by roosting Indiana bats, especially during the maternity season. By providing shade on some of the large snags a variety conditions will be maintained within the project area.*
- Retain a minimum of 10 to 15 square feet basal area of potential roost trees (where available: see Table 1, DN, SHNS Amendment) of a minimum size of 9 inches dbh per acre, on a stand average. Larger trees are preferred.
 - *Rationale: Retaining trees within the project area provides suitable habitat of foraging and future roosting habitat for Indiana bats. Trees do not need to be retained on a uniform distribution basis, but rather should occur on a stand average basis to maximize the ecological potential of the site.*
- Retain all shagbark, shellbark and red hickories that are at least pole size (6 inch dbh) or greater.
 - *Rationale: These species of hickory trees possess outstanding exfoliating bark characteristics and are highly desirable as roost sites by Indiana bats.*
- Retain all immediate roost trees regardless of size (SHNS EA, Chapter 7). These trees must be physically identified prior to project initiation. Should these trees be felled during project activity the Forest T & E Biologist and the USFWS shall be contacted.
 - *Rationale: Immediate roost trees provide the necessary characteristics to be use as roost sites by Indiana bats. These trees are marked prior to project initiation because they are difficult to recognize and marking will insure that they are retained during the duration of the project.*
- Design boundaries of harvested area shall be irregular in shape.

- *Rationale: Irregular boundaries provide additional linear area for Indiana bats to forage within a project area. Standing trees, utilized for overhead cover and roosting are immediately adjacent to open foraging areas.*
- Distribute some of the leave trees in clumps or strips containing 50 square feet of basal area per acre or 1/2 the density of the original stand whichever is greatest in order to provide travel/foraging habitat corridors.
 - *Rationale: Indiana bats travel and forage in areas where understory vegetation does not inhibit their flight path. Retaining overhead cover in clumps and strips will provide travel corridors and foraging areas not otherwise available in timber sale areas.*
- Some snags may be removed as incidental loss associated with project activities such as skid trails, log landings and roads, etc. The accidental felling of a snag, that is 9 inches or greater dbh, is reportable to the Forest T&E biologist and the USFWS.
 - *Rationale: It is recognized that some inadvertent loss of snags will occur. The accidental felling a snag 9 inches or greater dbh is by definition not part of the analysis of the proposed action. Thus, these trees should be reported, as described above, in order to fully determine annual effects on the Indiana bat roosting/foraging habitat.*

Restrict Indiana bat use of contaminated water sources (Unless otherwise noted, the standards and guidelines are current Forest Plan direction.)

- All sources of potentially toxic standing water or water sources that may entrap Indiana bats (e.g. brine pits, oil catch basins, etc.) should be filled, covered, or otherwise modified to prevent bats from attempting to drink from them.
 - *Rationale: These water sources pose a serious threat to bats or birds attempting to use them as a source of water. Highly toxic materials may be ingested with the water. Individuals may also become entrapped in ponds containing waste materials from mining or drilling operations.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

Monitoring of the general forest habitat association should provide enough information to adequately assess the composition, age class and presences of other habitat modifiers. This will allow basic determinations to be made regarding the ability of the habitat to support the group of species associated with the general forest. The following recommendations should be sufficient to allow these parameters to be tracked at a level necessary to determine if the association is providing the elements required for species persistence.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 – 15 years. (High priority)

- *Rational: Inventory may be at the stand level or larger units may be used (such as ecological management units or resources analysis units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*
- Inventory to identify and update forest vegetation databases after non-prescribed major disturbances. (High priority)
 - *Rational: Changes in forest type or age class that result from unplanned disturbances may impact planned management activities for a given area. To ensure that planned management is still in queue with the desired future condition for a planning area, inventory of these areas is necessary.*
- Employ GIS and vegetation management databases to track the condition and composition of the general forest. (High priority)
 - *Rational: The use of FSVeg (or CISC currently) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the general forest habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers.*
- Annual monitoring reports should include an analysis of the general forest habitat association using the latest inventory data. Copies of the spatial and tabular databases will be copied and stored for future reference. (High priority)
 - *Rational: This annual check of the conditions of the forest will help ensure that any potential management problems regarding the composition or age class structure of the forest are readily identified. This information should be displayed using the most up to date spatial and tabular databases.*
- Conduct annual R8 landbird monitoring program. (Medium priority)
 - *Rational: These monitoring processes will not only monitoring trends in landbird populations, but may also indicate general forest habitat conditions. Habitat type and age class stratifies these monitoring points. Changes in species composition may be related to some degree to changes in the habitat condition. However, consideration of these trends must take into account if the birds being monitored are Neotropical migrants or year-round residents. Migrants may experience adverse impacts in the winter habitat that could extrapolate to the breeding trends on the forest and not be a true indicator of breeding habitat conditions.*

References:

USDA Forest Service. 1985. Land and resource management plan. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

USDA Forest Service. 1997. Guidance for conserving and restoring old-growth forest communities on National Forests in the Southern Region: report of the Region 8 Old-Growth Team. Forestry Report R8-FR 62. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA.

USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

USDA Forest Service. 1998. Continuous inventory of stand conditions (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

Attachment A.

Species List: General Forest Habitat Association

Class	Common Name/Species
ANIMALS	
Amphibians	<p>Jefferson Salamander/ <i>Ambystoma jeffersonianum</i> Marbled Salamander/ <i>Ambystoma opacum</i> Green Salamander/ <i>Aneides aeneus</i> Four-toed Salamander/ <i>Hemidactylum scutatum</i> Wehrle's Salamander/ <i>Plethodon wehrlei</i> Wood Frog/ <i>Rana sylvestris</i></p>
Birds	<p>Sharp-shinned Hawk/ <i>Accipter striatus</i> Ruby-throated hummingbird/ <i>Archilochus colubris</i> Whip-poor-will/ <i>Caprimulgus vociferus</i> Lark sparrow/ <i>Chondestes grammacus</i> Northern flicker/ <i>Colaptes auratus</i> Northern Bobwhite/ <i>Colinus virginianus</i> Common Raven/ <i>Corvus corax</i> Black-throated Blue Warbler/ <i>Dendroica caerulescens</i> Prairie warbler/ <i>Dendroica discolor</i> Chestnut-sided warbler/ <i>Dendroica pensylvanica</i> Pileated Woodpecker/ <i>Dryocopus pileatus</i> Gray catbird/ <i>Dumetella carolinensis</i> Peregrine Falcon/ <i>Falco peregrinus</i> Common yellowthroat/ <i>Geothlypis trichas</i> Bald Eagle/ <i>Haliaeetus leucocephalus</i> Yellow-breasted Chat/ <i>Icteria virens</i> Red-headed woodpecker/ <i>Melanerpes erythrocephalus</i> Black-and-white Warbler/ <i>Mniotilta varia</i> Eastern Towhee/ <i>Pipilo erythrophthalmus</i> American Woodcock/ <i>Scolopax minor</i> Chipping sparrow/ <i>Spizella passerina</i> Bewick's Wren/ <i>Thryomanes bewickii altus</i> Golden-winged warbler/ <i>Vermivora chrysoptera</i> Canada Warbler/ <i>Wilsonia canadensis</i> Hooded Warbler/ <i>Wilsonia citrina</i></p>
Insects	<p>Sixbanded Longhorn Beetle/ <i>Dryobius sexnotatus</i> Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i> Diana Fritillary/ <i>Speyeria diana</i></p>
Mammals	<p>Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii rafinesquii</i> Virginia Big-eared Bat/ <i>Corynorhinus (Plecotus) townsendii virginianus</i></p>

Class	Common Name/Species Eastern Cougar/ <i>Felis concolor couguar</i> Eastern Small-footed Bat/ <i>Myotis leibii</i> Indiana Bat/ <i>Myotis sodalis</i> Allegheny Woodrat/ <i>Neotoma magister</i> Masked Shrew/ <i>Sorex cinereus cinereus</i> Eastern Spotted Skunk/ <i>Spilogale putorius</i> Black Bear/ <i>Ursus americanus</i>
Reptiles	Northern Scarlet Snake/ <i>Cemphora coccinea copei</i> Timber Rattlesnake/ <i>Crotalus horridus</i> Corn Snake/ <i>Elaphe gutta gutta</i> Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i> Southern Five-lined Skink/ <i>Eumeces inexpectatus</i> Scarlet Kingsnake/ <i>Lampropeltis triangulum elapsoides</i> Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i> Northern Pine Snake/ <i>Pituophis melanoleucus melanoleucus</i> Southeastern Crowned Snake/ <i>Tantilla coronata</i> Eastern Earth Snake/ <i>Virginia valeriae valeriae</i>
Snails	Banded Globe/ <i>Anguispira kochi</i> Pine Mountain Disc/ <i>Anguispira rugoderma</i> Queen Crater/ <i>Mesodon chilhoweensis</i> Clifty Covert/ <i>Mesodon wetherbyi</i> Wrinkled Button/ <i>Mesomphix rugeli</i> Glossy Supercoil/ <i>Paravitrea placentula</i> Delicate vertigo/ <i>Vertigo bollesiana</i> Cupped Vertigo/ <i>Vertigo clappi</i>
FUNGI	Sulphur Shelf/ <i>Laetioporus sulphureus</i> Morel/ <i>Morchellus esculentus</i>
LICHENS	Reindeer Lichen/ <i>Cladina</i> spp (cf. <i>rangiferina</i> , <i>stellaris</i> , <i>subtenuis</i>)
PLANTS	
Dicots	Mountain Maple/ <i>Acer spicatum</i> Blue Monkshood/ <i>Aconitum uncinatum ssp. uncinatum</i> Running Serviceberry/ <i>Amelanchier stolonifera</i> Yellow Screwstem/ <i>Bartonia virginica</i> American Chestnut/ <i>Castanea dentata</i> Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i> Carolina Allspice/ <i>Calycanthus floridanus</i> Sweetshrub/ <i>Calycanthus floridus var. glaucus</i> Chinquapin (generic)/ <i>Castanea pumila</i> Allegheny Chinquapin/ <i>Castanea pumila var. pumila</i>

Class

Common Name/Species

Green-and-gold/ *Chrysogonum virginianum* var. *virginianum*
 Black Cohosh/ *Cimicifuga racemosa*
 Small Enchanter's-nightshade/ *Circaea alpina* ssp. *alpina*
 White-leaf Leather-flower/ *Clematis glaucophylla*
 Stoneroot/ *Collinsonia verticillata*
 Sweet-fern/ *Comptonia peregrina*
 Cumberland Rosemary/ *Conradina verticillata*
 Beechdrops/ *Epifagus virginianus*
 Yucca-leaved Rattlesnake Master/ *Eryngium yuccifolium*
 Small-flowered Thoroughwort/ *Eupatorium semiserratum*
 Mercury Spurge/ *Euphorbia mercurialina*
 Box Huckleberry/ *Gaylussacia brachycera*
 Yellow Gentian/ *Gentiana alba*
 Red-disked Sunflower/ *Helianthus atrorubens*
 Goldenseal/ *Hydrastis canadensis*
 American Water-pennywort/ *Hydrocotyle americana*
 St. Peter's-wort/ *Hypericum crux-andreae*
 Butternut/ *Juglans cinerea*
 Smooth Veiny Peavine/ *Lathyrus venosus*
 American Gromwell/ *Lithospermum latifolium*
 Fraser's Loosestrife/ *Lysimachia fraseri*
 Carolina Anglepod/ *Matelea carolinensis*
 Barbara's Buttons/ *Marshallia grandiflora*
 American Cow-wheat/ *Melampyrum lineare* var. *lineare*
 Sweet Pinesap/ *Monotropsis odorata*
 Thread-leaf Sundrops/ *Oenothera linifolia*
 Small Sundrops/ *Oenothera perennis*
 Mountain Wood Sorrel/ *Oxalis monatana*
 Kidney-leaf Grass-of-Parnassus/ *Parnassia asarifolia*
 Mock Orange/ *Philadelphus inodorus*
 Gaywings/ *Polygala pauciflora*
 Nodding Rattlesnake-root/ *Prenanthes crepidinea*
 Wafer Ash, Hop-tree/ *Ptelea trifoliata*
 Nettle-leaf Sage/ *Salvia urticifolia*
 Sanicle/ *Sanicula canadensis*
 Ovate Catchfly/ *Silene ovata*
 Royal Catchfly/ *Silene regia*
 Wasio to Rosinweed/ *Silphium wasiotense*
 Bay Starvine/ *Schisandra glabra*
 Big-flowered Snowbell/ *Styrax grandiflorus*
 Snowberry/ *Symphoricarpos albus*
 Synandra/ *Synandra hispidula*
 Spiked Hoary-pea/ *Tephrosia spicata*
 Cutleaf Meadow-parsnip/ *Thaspium pinnatifidum*
 Velvet Bush Pea/ *Thermopsis mollis* (generic)

Class	Common Name/Species Running Buffalo Clover/ <i>Trifolium stoloniferum</i> Slippery Elm/ <i>Ulmus rubra</i> Bird's-foot Violet/ <i>Viola pedata</i> Toothache-tree/ <i>Zanthoxylum americana</i>
Monocots	Wild Agave/ <i>Agave virginica</i> Cane/ <i>Arundinaria gigantea</i> Cypress-swamp Caric Sedge/ <i>Carex joorii</i> Boott's Caric Sedge/ <i>Carex picta</i> Caric Sedge/ <i>Carex seorsa</i> Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i> Spotted Coralroot/ <i>Corallorhiza maculata</i> Pink Lady's-slipper/ <i>Cypripedium acaule</i> Small Yellow Lady's-slipper/ <i>Cypripedium parviflorum</i> var. <i>parviflorum</i> Wild Yam/ <i>Dioscorea villosa</i> Bearded Skeleton Grass/ <i>Gymnopogon ambiguus</i> Wood Lily/ <i>Lilium philadelphicum</i> var. <i>philadelphicum</i> Wild Lily-of-the-Valley/ <i>Maianthemum canadense</i> Small-flowered False Hellebore/ <i>Melanthium parviflorum</i> Clubspur Orchid/ <i>Platanthera clavellata</i> Small Purple-fringed Orchid/ <i>Platanthera psycodes</i> Swamp Wedgscale/ <i>Sphenopholis pensylvanica</i>
Mosses	Moss/ <i>Brothera leana</i> Feather Moss, Log Moss/ <i>Hypnum curvifolium</i> Feather Moss, Log Moss/ <i>Hypnum imponens</i> Juniper Hair Cap Moss/ <i>Polytrichum juniperinum</i> Moss/ <i>Syrrhopodon texanus</i> Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>

Attachment B.

General Forest Species/Habitat Relationships with References

ANIMALS

Amphibians

Jefferson salamander -- *Ambystoma jeffersonianum* -- Jefferson salamander is found primarily in shady deciduous forests or mixed woods, low woods and bottomlands. This salamander requires abundant leaf litter, rocks, decomposing logs and stumps. During breeding season, the Jefferson salamander requires temporary ponds, ideally with a pH between 5 and 6 (DeGraff and Rudis, 1986). This salamander is an opportunistic feeder consuming small invertebrates. (Wilson, 1995).

Marbled salamander -- *Ambystoma opacum* -- The marbled salamander occupies a variety of habitats, ranging from pine forests to mixed pine-hardwoods and apparently does best in areas where abundant leaf litter and fallen logs provide shelter. This salamander will spend much of its' time in burrows, leaf litter or under bark and logs. During late fall, the marbled salamander moves into bottomland hardwoods and deposits its eggs terrestrially. This salamander requires areas subject to fluctuating water levels for breeding and larvae development. The marbled salamander will eat a variety of food items such as insects, other small arthropods, earthworms, snails, and slugs. (Wilson, 1995).

Green salamander -- *Aneides aeneus*-- The green salamander lives in damp crevices in shaded rock outcrops and ledges. In cove hardwoods, this salamander can be observed under bark and cracks of trees (Gordan, 1967). In the general forested area, the green salamander occurs in mucky, boggy water among decaying leaves and logs around woodland streams and ponds (website. Biodiversity. Wku.edu). The green salamander has also been observed in upland pine areas, Virginia pine and white pine-hemlock with mountain laurel occupying the understory. Moist outcrops are required for egg depositing and larval development. (Wilson, 1995).

Four-toed salamander -- *Hemidactylum scutatum* -- The four-toed salamander is usually associated with sphagnum bogs or slow-moving streams with abundant moss or sedges adjacent to woodland areas. Adults live under rocks, logs, leaves or moss in maple-beech and other hardwood forests. They can also be observed in coniferous woods such as loblolly, short-leaf pine, and Virginia pines. The larvae live in pools, bogs or slow-moving streams with moss or sedges (Neill, 1963). The four-toed salamander is terrestrial as an adult, requiring woodlands near sphagnum ponds, streams or bogs. The larvae are aquatic and require a permanent water source. The four-toed salamander is an opportunistic feeder with a diet consisting of small arthropods and worms. (Wilson, 1995).

Wehrle's salamander -- *Plethodon wehrlei* -- The Wehrle's salamander is found in the Appalachian Mountains from extreme southwestern New York southward through Pennsylvania, southeastern Ohio, West Virginia, and Virginia to Stokes County, North Carolina. A disjunct enclave occurs along the Kentucky-Virginia-Tennessee border. Wehrle's salamander is commonly found on wooded hillsides where it hides under rocks and less frequently under and

within logs. It has been found near cave entrances, within deep rock crevices and in old second growth, mixed deciduous and coniferous forests. Wehrle's salamander requires moist wooded hillsides with surface debris in the form of rocks, logs and leaf litter. In early summer, the female will deposit a small cluster of eggs in damp logs, soil, or moss. She will remain with the eggs until they hatch. This salamander's diet consists of small invertebrates, especially insects, spiders and earthworms. (Wilson, 1995)

Wood Frog -- *Rana sylvatica* -- The wood frog lives in or near moist woods, hardwood valleys and occasionally white pine-hemlock, and upland pine forest types. The wood frog breeds in open-water ponds, slow-moving portions of streams and roadside ditches. The wood frog's diet consists mainly of insects. Adults require upland forest areas with logs, stumps and rocks for overwintering and moist woods with standing water during the late winter months. (Wilson, 1995)

Birds

Sharp-shinned Hawk (*Accipiter striatus*) This species occurs in pine, hemlock/pine, and oak woods in Kentucky. Pines and hemlock seem to be preferred for nesting and over-wintering in Kentucky. Nesting is typically in the canopy of a large tree within an extensive tract of mature forest. On the DBNF, Sharp-shinned Hawks are observed foraging most frequently in mature forests of both mixed pine-hardwood and pure hardwood, generally where the midstory is fairly open, allowing the birds to swoop below the forest canopy (L. Perry, pers. obs.). Sharp-shinned hawks do forage within areas having a mix of forested and semi-open habitat; however, they more frequently occupy forested areas and are considered a Forest Interior species. While this species is relatively specific in its nesting habitat requirements, it is much less restrictive in where it forages and is likely to be found foraging throughout the general forest, regardless of forest type.

Ruby-throated Hummingbird (*Archilochus colubris*) Ruby-throated Hummingbirds can be found in a variety of habitats--including wooded wetlands, fields, ravines, and upland woods—where there is an abundance of tubular flowers from which to feed. Sites are usually moist, although this is not a strict requirement. In areas of human habitation, artificial feeders and garden plantings are utilized. Nests are built in deciduous trees and shrubs, usually in undisturbed areas of mature forest, and are often located over streams or openings (Palmer-Ball, 1996). While this species is relatively selective in its nesting habitat requirements, it is much less selective in where it forages and is likely to be found foraging throughout the general forest, regardless of forest type.

Whip-poor-will (*Caprimulgus vociferus*) Whip-poor-wills occupy areas with medium growth hardwood and mixed forest, often in upland and edge habitats. The birds forage for insects in grassy forest openings and fields. Breeding is in forest and forest edges, usually near fields and open habitat. This species requires areas of extensive forest. This species would be expected to nest in any forest type, as long as early successional habitat or edge habitat is provided.

Lark Sparrow (*Chondestes grammacus*) Although Lark Sparrows occur in grasslands, this is not a typical grassland species. These birds seem to require disturbance habitats--such as rock outcrops, sandhills, and erosion gullies--that provide sparse groundcover interspersed with bare

soil or rock (Mengel 1965). Early successional stage upland woods, forest openings, meadows, pastures, roadsides, waste areas with bare, rocky soil, and old fields with scattered shrubs or trees are among the habitats utilized. This species would be expected to nest in any forest type, as long as early successional habitat or edge habitat is provided.

Northern Flicker (*Colaptes auratus*) This is a species that occurs in open and semi-open woodlands and groves with relatively large trees. It occurs most frequently in areas with a combination of dissected wooded tracts and open ground—suppression of fire has likely contributed to a general decline of habitat (Palmer-Ball, 1996). These birds frequently feed off the forest floor, as well as in trees. Nesting is in dead trees or dead limbs of live trees. Forests and groves (usually hardwood), wood edges, and clearings within mature forest are typically used. This species is not particularly attracted to any single forest type and could be expected to occur throughout the general forest, provided that semi-open to open conditions and suitable dead trees are present.

Northern Bobwhite (*Colinus virginianus*) Bobwhite utilize a variety of open and semi-open habitats, including woodland (especially pine), fields, fencerows, cedar thickets, and forest edges. Bobwhite prefer abandoned fields, warm season grasses and clover, although they do occur in smaller numbers in fescue. They are particularly fond of brushy conditions. Nests are made in grassy/weedy, fairly open areas near cover provided by forest edge or brushy borders. On the DBNF, birds are frequently observed with broods in open, pine-hardwood stands that have been heavily burned and have open, well-lit understory with scattered grasses and forbs (L. Perry, pers. obs.). This species is not particularly attracted to any single forest type and could be expected to occur throughout the general forest, provided that open conditions with a sparse, grassy understory are present.

Common Raven (*Corvus corax*) This species is typically found at elevations above 3500 feet but may occur down to 1500 feet (Hamel, 1992). Typically utilizes rocky and remote cliffline and is rarely found in areas without rocky outcrops. In Kentucky, they are typically birds of remote places and are rarely seen away from extensively forested portions of the mountains (Palmer-Ball, 1996). This species is more typical of the high elevation areas along Pine and Black Mountain. While this species is relatively selective in its nesting habitat requirements, it is much less selective in where it forages and is likely to be found foraging throughout the general forest, regardless of forest type.

Black-throated Blue Warbler (*Dendroica caerulescens*) Although the breeding population of this bird extends into Southeastern KY, it is primarily restricted to higher elevations (e.g., on Pine, Black, and Cumberland Mountains). Records of individuals occurring below 2500 feet are scarce. The species utilizes a wide variety of forest types, including forest edge and second growth-type habitats, provided a moderate to dense understory is present—Rhododendron and Mountain Laurel being favored understory species. Areas having denser understory are chosen for nesting. Extensive tracts of medium-growth/mid-age forest are necessary for this forest interior species, which requires a minimum tract size of 2500 hectares (Hamel 1992). This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided a dense ericaceous shrub understory is present.

Prairie Warbler (*Dendroica discolor*) Prairie Warblers occur in semi-open, early successional, and woodland habitats. Mixed forest types—especially those that have been cut-over or burned--with pines and cedars are occupied. Forest edges, clearings, brushy borders, and overgrown fields with scattered saplings or small trees are commonly used. On the DBNF, the birds are nearly always found in early successional habitat, especially young clearcuts and the undergrowth of shelterwood cuts, and often at wood edges and in stands that have been burned (L. Perry, pers. obs.). This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that early successional habitat in the form of young forest or old field and edge situations are present.

Chestnut-sided Warbler (*Dendroica pensylvanica*) This is typically a bird of early successional openings and forest edge where a dense shrub layer of weeds, briars, and young trees predominate (Palmer-Ball, 1996). This species is usually found in the mountains above 3500 feet but may occur sparingly down to 2000 feet (Hamel, 1992). Tends to inhabit rather open and dry areas having some woody vegetation in the form of shrubs and small trees (DeGraaf et. al., 1991). This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that early successional habitat in the form of young forest or old field and edge situations are present.

Pileated Woodpecker (*Dryocopus pileatus*) Pileated Woodpeckers require extensive tracts of mature, primarily deciduous, forest. Hamel lists the minimum required tract size as 405 ha (1992). A variety of forest types are used, from upland woods to wooded wetlands, provided large trees (at least 20" dbh) are available for nesting, roosting, and perching. Birds nest in standing, large, dead trees, usually within heavily forested areas, and forage in both standing and fallen trees. This species is not particularly attracted to any single forest type and could be expected to occur throughout the general forest, provided that large tracts of mature forest and suitable nest trees are provided.

Gray Catbird (*Dumetella carolinensis*) This species most frequently inhabits old fields, woodland edge, forest clear-cuts and rural settlement areas. Wherever it occurs the species is typically associated with dense brushy cover (Palmer-Ball, 1996). Prefers moist, dense, dark, tangled vegetation especially in shrubbery (Hamel, 1992). Monitoring records on the DBNF indicate that this species is most common in the non-forested habitat group. This indicates that most occurrences were in old fields or openings. This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that early successional habitat in the form of young forest or old field and edge situations are present.

Peregrine Falcon (*Falco peregrinus*) Historically, this species likely inhabited clifflines in the Cumberland Mountains and Cliffs section of the Cumberland Plateau, as well as bluffs along the Kentucky and Ohio Rivers and hollow trees of cypress swamps in Western KY (Palmer-Ball, 1996). Mengel mentions observing the presence of nesting Peregrine Falcons in cliff overlooking the Rockcastle River (1965). The birds nest only in remote sandstone or limestone cliffs that have ledges. Foraging is in open areas with a mix of forest and fields. Reintroduction efforts in the State, primarily on tall buildings in urban areas but also on cliff on the Stanton R.D. are increasing Kentucky populations of falcons, which were decimated by the effects of DDT. While this species is relatively selective in its nesting habitat requirements, it is much less selective in

where it forages and is likely to be found foraging throughout the general forest, regardless of forest type.

Common Yellowthroat (*Geothlypis trichas*) This species is typical of areas with shrubs, brush or tall herbs generally in more open country that is somewhat moist in nature (Hamel, 1992). Usually found in abandon fields, areas with grassy or shrubby borders, marshes, low damp meadows with a profusion of rank growth, and remnants of tallgrass prairies (Palmer-Ball, 1996). Monitoring data collected on the DBNF indicates that this species was most common in non-forested areas less than 10 years old. This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that early successional habitat in the form of young forest or old field and edge situations are present.

Bald Eagle (*Haliaeetus leucocephalus*) This federally listed species is dependent on aquatic habitat, primarily river floodplains, lakes, and natural and human-built reservoirs. It utilizes both standing and flowing fresh water sources (and salt water, in coastal areas) that have large trees suitable for nesting, perching and roosting. Suitable trees are at least 20" dbh in size and usually growing near the water (Hamel, 1992). In Kentucky, the birds have nested and wintered around wetland/floodplain habitats and reservoirs resulting from the impoundment of rivers (e.g., Laurel River Lake on the DBNF). Wintering birds are known to occur on major impoundments on the DBNF. Records of attempted nesting exist for Laurel River Lake although no active nests are currently known to exist. While this species is relatively selective in its nesting habitat requirements, it is much less selective in where it forages and is likely to be found foraging throughout the general forest, regardless of forest type, provided that a body of water such as a large river or lake is present.

Yellow-breasted Chat (*Icteria virens*) This is a species of early successional habitats, including: thickets; overgrown fields; hedgerows; forest edges; and openings. The key requirement is dense cover of shrubs and/or saplings. These birds avoid mature forest interiors and nest in shrubby, brushy areas. On the DBNF, they are often encountered in thickets, (regenerating) clearcuts, and dense undergrowth of shelterwood cuts—nearly always in cut-over or early successional habitat (L. Perry, pers. obs.). The species tends to be more abundant in harvested than in non-harvested areas (Baker and Lacki 1997). This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that early successional habitat in the form of young forest or old field and edge situations are present.

Red-headed Woodpecker (*Melanerpes erythrocephalus*) Semi-open to open habitat with an abundance of large (>14" dbh), dead trees is preferred for both breeding and wintering purposes. Relatively open, mature woods, swamps, clearings within mixed woodland, forest edges, and places where groves of trees are present, such as park-like settings, are commonly used. On the DBNF, the birds are often observed in pine-dominated stands that have been frequently burned (L. Perry, pers. obs.). Nesting is in dead trees, or in dead limbs of live trees (Mengel 1965). This species generally avoids mature closed canopy forest during the breeding season (Palmer-Ball, 1996). This species is not particularly attracted to any single forest type and could be expected to occur throughout the general forest, provided that open conditions and suitable nest trees are present.

Black and White Warbler (*Mniotilta varia*) This species may occur in a variety of forest age classes. It may inhabit younger forest as well as forest recovering from selective logging (Palmer-Ball, 1996). Typically, it is thought of as being more common in mature hardwood forest (Mengel, 1965). Records on the DBNF indicate that it is most common in regenerating forest less than 10 years old. It also appears to be more common in forests with slopes rather than in areas with little or no relief (Palmer-Ball, 1996). The black-and-white warbler would be expected to occur throughout the forest, regardless of forest type.

Eastern Towhee (*Pipilo erythrophthalmus*) This species typically occurs in managed or artificial situations such as brushy forest edge, regenerating clear-cuts, and forest disturbed by selective logging (Palmer-Ball, 1996). It may also be found in the lower growth of open or cutover forest (Mengel, 1965). This species is dependent on dense brushy cover (DeGraaf et. al., 1991) that may be found in a variety of situations. Monitoring data collected on the DBNF indicates that this species is most common in mixed pine habitat less than 10 years old. This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that early successional habitat in the form of young forest or old field and edge situations are present.

American Woodcock (*Scolopax minor*) This species typically requires moist woodlands in early stages of succession. It may use open fields, cultivated land, pastures and clearings at least ¼ acre in size (DeGraaf et. al., 1991). It generally requires poorly drained soils with an abundance of earthworms for feeding, nearby fields or small forest openings for courtship and roost site (DeGraaf et. al., 1991) and is largely absent from extensive areas of mature forest (Palmer-Ball, 1996). The presences of edge habitat and a high shrub stem density may be important for nest site selection in some areas (NatureServe, 2001). Appears to be partial to sheltered wet thickets along meandering streams (Barbour et. al., 1973). This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that soil conditions are moist and early successional habitat in the form of young forest, old field and forest edge situations are present.

Chipping Sparrow (*Spizella passerina*) This species occurs mainly in grassland areas with scattered trees (DeGraaf et. al., 1991) or in open woodlands where the understory is sparse as a result of grazing, burning or soil conditions (Mengel, 1965). It may occur in moderate numbers in open pine-oak upland forest on dry ridges of the Cumberland Plateau (Mengel, 1965). In KY this species is frequently found in forested areas dissected by numerous small to moderate sized openings (Palmer-Ball, 1996). DBNF monitoring data indicates that the greatest number of occurrences were in mixed-pine habitat less than 10 years old. This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that open conditions with a sparse, grassy understory are present.

Bewick's Wren (*Thryomanes bewickii altus*) Habitat requirements for this species are open country with shrubs, saplings and/or brushpiles and snags at least 6 inches in diameter (Hamel, 1992). May occur in open forests but requires a brushy understory (DeGraaf et. al., 1991). Nest are built in cavities, crannies, or placed on ledges. This species does not construct its own cavities (Hamel, 1992). In KY small numbers may also inhabit suburban yards in towns, brushy forest margins and forest clear-cuts (Palmer-Ball, 1996). This species is not particularly attracted

to any one forest type and could be expected to occur throughout the general forest, provided that understory of early successional habitat in the form of young forest or old field and edge situations are present.

Golden-winged Warbler (*Vermivora chrysoptera*) This species favors abandon fields with scattered deciduous trees (Hamel, 1992). It occurs in greatest numbers at elevations between 2000 and 4000 feet but may rarely occur lower (Hamel, 1992). In Kentucky the species is generally a bird of the drier slopes that have been cleared in the recent past, including reverting clear-cuts (Palmer-Ball, 1996). Kentucky populations are basically restricted to the higher elevations in the mountainous region in the southeastern part of the state. This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that early successional habitat in the form of young forest or old field and edge situations are present.

Canada Warbler (*Wilsonia canadensis*) This species is more common in the mountainous regions north of Kentucky, but the breeding population does extend into the Southeast part of the State, in the Cumberlands—on Black Mountain and Cumberland Mountain. Canada Warblers only become common at elevations above 3500 feet, as they do on top of Black Mountain. They occur in a variety of mesic forest types, within stands of differing age classes, and in forest edge habitat, as well. The common requirement is that the stands have a dense shrub/understory layer, especially of rhododendron and, to a lesser extent, laurel. The minimum required tract size for the species is 1000 hectares (Hamel 1992). This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided a dense ericaceous shrub understory is present.

Hooded Warbler (*Wilsonia citrina*) Hooded Warblers are most frequent in deciduous and mixed forest, usually on mesic sites. However, they occur in a variety of different habitat types on the Forest that possess a dense, deciduous understory. Disturbed, regenerating areas, the margins of cut-over stands, and moist sites often provide the thick, shrubby understory that the species requires (Hamel, 1992). This species is not particularly attracted to any one forest type and could be expected to occur throughout the general forest, provided that early successional habitat in the form of a deciduous understory is present.

Mammals

Rafinesque Big-eared Bat – *Corynorhinus (Plecotus) rafinesquii rafinesquii* – is a year-round resident throughout the DBNF. During the summer it forages in a variety of forested habitats and in forest edges and open areas. During the day it will roost in limestone and sandstone rockhouses and caves, in hollow trees and under exfoliating bark. During the summer males tend to be solitary roosters while females form maternity colonies. Several maternity colonies, usually associated with cliffline caves and rockhouses, occur on the forest. This species is insectivorous and feeds primarily on moths. Foraging sites often occur along clifflines or ridgelines in an oak-hickory habitat. Cliffline associated rock shelters are used as feeding sites. Clifflines are also thought to provide travel corridors for the Rafinesque's big-eared bat. During the summer this species normally forages within about one mile of the roost site. Hibernation sites occur mainly in caves, but some sites occur in rockshelters and in large cracks in sandstone cliffline. This species is very sensitive to human disturbance of both its hibernation and maternity colony sites.

Virginia Big-eared Bat – *Corynorhinus (Plecotus) townsendii virginianus* – is a year-round resident on the northern half of the DBNF. Foraging habitat occurs in many different forest overstory types, but is commonly associated with sandstone and limestone cliffclines and ridgetops. This species also forages over grassy forest openings (old fields) and along forest edge. Forest openings may provide uncluttered foraging space where preferred prey species occur and can be more easily captured. Sandstone rockshelters and small caves are utilized as temporary feeding roosts. In the summer female and young Virginia big-eared bats form nursery colonies while males are ordinarily solitary although some bachelor colonies do occur. Maternity colonies usually roost near the entrance of rockshelters or caves at the edge of the light zone. Thus, they are very susceptible to human disturbance. Food habits consist primarily of small moths, but also include butterflies, flies and beetles. Forest canopy around roost sites may provide important protection from potential predators such as owls. Virginia big-eared bats hibernate in large clusters in a few limestone caves on the DBNF. As in the summer, they are highly susceptible to human disturbance and may abandon a colony site after repeated human intrusion. Maintaining stable microhabitat conditions and forested communities around the maternity and hibernation caves is important to maintaining these sites.

Eastern Cougar – *Felis concolor couguar* – historically, ranged throughout the DBNF. No documented record of this species has occurred on the forest for more than 100 years. This species requires large areas of wilderness-like habitat relatively undisturbed by humans. Due to the interspersed ownership and high public use of the DBNF current levels of human disturbance seem to preclude the return of the eastern cougar to its formally inhabited range. Programmatically, the USFWS has determined that all actions on the DBNF have a “no effect” finding for the eastern cougar.

Eastern Small-footed Bat – *Myotis leibii* – likely occurs in forested areas throughout the DBNF. Foraging habitat is often associated with riparian areas, but may occur elsewhere in the forest or forest edge. Summer roosting habitat includes caves, under rocks, bridges (in expansion joints), hollow trees and under exfoliating bark. Food habits are thought to be almost exclusively flying insects associated with riparian habitats. Reproducing females have been found in Eastern Kentucky, but the species is believed to be most common on the DBNF during the winter. Winter hibernation often occurs in relatively cold areas of low humidity just within the entrance of caves or mines. Thus, the eastern small-footed bat may be vulnerable to freezing in severe winters and to human disturbance. The species also hibernates in rock shelters and in fissures within cliffclines.

Indiana Bat – *Myotis sodalis* – is known to be present on the DBNF in both winter and summer colonies of the Indiana bat. During the non-hibernation season Indiana bats are likely to occur throughout the DBNF. Some males periodically roost in caves during the summer, but most, along with females, roost under exfoliating bark or in hollow cavities in a variety of dead and alive trees. Roost trees with some sun exposure seem to be preferred because they are warmer. Indiana bats forage for insects in a wide variety of forest habitats ranging from riparian corridors to upland oak to higher elevation ridgetops. Forest canopy ranges from relatively closed to fairly open and Indiana bats sometimes forage in and near grass areas at the forest edge. An open forest understory enhances the bats ability to navigate within the forest stands. Available water in the form of shallow waterholes or ponds enhances general habitat suitability and utilization. Maternity populations are known to exist on the DBNF. Female Indiana bats are known to use

multiple roost trees during the lactation period and may forage and roost up to 2 ½ miles from their primary roost trees. During the winter Indiana bats hibernate in several cool/cold limestone caves on the DBNF. These bats gather in large clusters on cave ceiling and need protection from human disturbance during this time of year. Significant hibernation caves occur on the Stanton, London and Somerset Ranger Districts. Hibernation caves are most often, but not always, associated with limestone cliff lines. Maintaining forest canopy around hibernation caves helps maintain microclimate conditions and provides nearby roosting and foraging habitat, particularly during the fall swarming season.

Masked Shrew – *Sorex cinereus cinereus* – is associated with higher elevations of the conifer-northern hardwood habitat association. They are found in deep, moist woodlands and prefer areas of thick leaf mold and decaying fallen logs. Masked shrews may occur in small populations on the Redbird Ranger District, DBNF. The species may occur in other forested habitats, particularly near stream head seeps, that have the right conditions to support numerous invertebrate food species and moisture conditions. The dens of masked shrews are located in cavities in logs or snags, under logs or in shallow burrows. In streamside areas they may be found in communities dominated by hemlock/rhododendron. The diet of this species consists of a variety of invertebrates and small vertebrate animals. They prefer moist habitats and access to free water may be important.

Eastern Spotted Skunk – *Spilogale putorius* – likely occurs in low population numbers in the general forest area throughout the DBNF. It is often associated with rocky areas and cliff lines. This species prefers forest borders and brushy fields and avoids heavy timber. Forest openings offer a good combination of preferred habitat types. Natural cavities in cliff lines, down logs and hollow snags provide shelter and den sites. They also use abandoned underground burrows of other species as den sites. Several skunks may den together in the winter, but they do not hibernate. Eastern spotted skunks forage for food throughout their habitat and are omnivorous. Food items include beetles, small rodents, ground dwelling birds, eggs, lizards, snakes salamanders mushrooms and fruit.

Black Bear – *Ursus americanus* – although not common, once inhabited much of the forested area, which is now the DBNF. In recent years black bears have once again been seen in low numbers throughout much of the DBNF. This species prefers relatively remote forested areas away from human disturbance. However, black bears can adapt to the human presence in the forest. Escape cover, in the form of dense thickets under relatively open forest canopy, is an important component of black bear habitat. Winter dens may be shallow caves, large hollow logs, large standing hollow snags or a cavity under the roots of a downed tree. All forested habitats on the DBNF could provide suitable habitat for black bears. The black bears food habitats can be characterized as opportunistic omnivore commonly including berries, nuts, insects, carrion and other vegetable and animal matter.

Reptiles

Northern Scarlet Snake -- *Cemophora coccinea copei* -- This is a burrowing species that is rarely seen, typically venturing out only at night or after heavy rains. It is usually found under logs, stones, leaf litter, pine needles, or bark; it is occasionally turned up during plowing or excavation work (Behler and King 1979; Conant and Collins 1991). While they have occasionally been

found in open fields and residential areas, Scarlet Snakes primarily occur in woodlands, including pine, hardwood, and mixed forests (Barbour 1971) with sandy or other friable, well-drained soils that are suitable for burrowing. They are most common in open habitat and benefit from management practices, such as periodic burning and selective thinning, that retain open canopy, early successional conditions (Wilson 1995). Scarlet Snakes feed on the eggs of other reptiles, and on mice, insects, smaller snakes, lizards, and salamanders.

Timber Rattlesnake -- *Crotalus horridus* -- The timber rattlesnake occurs from central Vermont to Iowa in the north and northern Florida to eastern Texas in the south. This rattlesnake inhabits a variety of habitats. In the mountains and foothills it prefers moderately steep, rocky ridge tops with light ground cover. During the fall and spring, timber rattlesnakes are frequently found around rocky ledges with southern exposure. Additional habitats include sphagnum swamps, agricultural fields and second growth clearings. Rock outcrops, old buildings or logs are necessary for winter denning. The timber rattlesnake feeds primarily on small mammals, as well as an occasional bird, amphibian or snake (Mount, 1975; Wilson, 1995).

Corn Snake -- *Elaphe guttata guttata* -- Although this subspecies occurs in disjunct populations in eastern and west-central KY, Corn Snakes in general are much more common in other southeastern States. Typical habitat includes pine and pine-hardwood forests, rocky hillsides, old fields, openings within bottomland hardwoods, and, to a lesser extent, forested swamps. Open woodland, ranging from uplands to lowlands, with an abundance of rocks and logs for cover is preferred--especially when bordering old or cultivated fields that increase foraging success. Corn snakes are fairly secretive, spending much of their time concealed under surface cover, in stumps, under bark, or in the burrows of other animals (Wilson 1995). However, they readily climb trees and enter abandoned houses and barns in search of prey: mice, rats, birds, and bats (Behler and King 1979). These snakes are most often encountered along woodland edges, overgrown fencerows, and around farmsteads (Barbour 1971).

Northern Coal Skink -- *Eumeces anthracinus anthracinus* -- The Appalachian population of this subspecies extends into eastern KY, while a disjunct population occurs in the west-central part of the State. Suitable habitat includes damp forests of oak, oak-poplar, oak-hickory-pine, and mixed pine-hardwood with moist soils, abundant leaf litter, logs, and/or loose stones; humid wooded or rocky hillsides; rocky bluffs; and similar areas near water sources, such as streams, springs, swamps, and bogs. These skinks seek the cover of rocks, logs, stumps, brush, and rock slabs. When pursued, they will take refuge in shallow water, hiding under rocks at the bottom. Various rocky areas in which they have been found include: on limestone ledges; in dry leaves beneath rock ledges; beneath flat slabs of sandstone; under rocks in sunlit forest openings and in grassy cut over areas in hardwoods; and under rocks in the slope of a road cut through a mixed forest (VA Dept. of Game and Inland Fisheries 2001). Use of fire to maintain grassy openings within forested stands is of benefit to this species. Coal Skinks feed primarily on insects and spiders.

Southern Five-lined Skink -- *Eumeces inexpectatus* -- The southern five-lined skink ranges from Virginia south to the Florida Keys, and westward to the Mississippi River. This skink is most abundant in dry habitats, such as pine clearings, beaches, ridge tops and well-drained, sandy places. This species has been documented around man-made structures, field and wood edges, urban woodlots, dry pine forests, mixed pine-hardwood forests, early stages of lowland pine communities and sawdust piles. (Virginia website.) This skink is considered terrestrial and

arboreal. The southeastern five-lined skink diet consists of a variety of arthropods. (Wilson, 1995)

Scarlet Kingsnake -- *Lampropeltis triangulum elapsoides* -- This snake's size and ecology vary considerably from those of the Milk Snake *L. triangulum*, of which it is considered a subspecies (Wilson 1995). The Scarlet Kingsnake prefers wooded areas, including pine, oak and other hardwoods, and mixed stands. It is typically found under rotting logs and debris, in stumps, and underneath the bark of dead trees. It is apparently a burrower in upland forests with deep sandy soils (Morehead Cooperative Inventory 1992). This small species appears to utilize pine snags to a great extent for hibernation and spring activity; management practices should include leaving a certain number of snags in pine habitat (Wilson 1995). The Scarlet Kingsnake is shy and secretive, normally emerging from hiding only at night or after a heavy rain, and is adept at worming its way into small cracks and crevices, either into logs or rocks, or to considerable depths in the ground (Barbour 1971). Its diet includes small snakes and lizards, mice, insects, and earthworms.

Eastern Slender Glass Lizard – *Ophisaurus attenuatus longicaudus* – This is a species of dry, often sandy, soil conditions. It occurs in relatively open, typically upland, habitats--including Virginia and Shortleaf Pine and pine-oak stands, forest edges, grassy fields and prairies--which have loose, friable soils. This secretive, legless lizard tends to stay in old rodent burrows and under mats of dead grass and decomposing plants; when it basks in the sun, it is often hidden in tall grass or with only part of its body showing (VA Dept. of Game and Inland Fisheries 2001). Slender Glass Lizard diets include insects, spiders, birds' eggs, smaller lizards, and snakes. Prescribed burning and other management practices that help to create open canopy conditions benefit this lizard species.

Northern Pine Snake – *Pituophis melanoleucus melanoleucus* – Pine Snakes inhabit dry, sandy pine and pine-oak forest types with open canopies and patchy to dense ground cover. Eastern KY sites are typically upland or ridgetop; whereas, at lower elevations the snakes utilize pine flatwoods and sandhill areas. Forest openings with scattered areas of well-drained sand and little shrub cover are required for nesting and hibernation sites (NatureServe 2001). These secretive snakes spend much of their time in burrows, emerging to hunt for small mammals, birds and eggs; they climb trees well. Loose or friable soil is needed, since the snakes excavate their own burrows as well as use those made by small mammals. This species requires a relatively large area in which to forage (Wilson 1995). Management practices, including midstory control and prescribed burning, which serve to promote and maintain barrens-like conditions—open stands with well-lit, grassy understories—are necessary to support the species.

Southeastern Crowned Snake -- *Tantilla coronata* -- The southeastern crowned snake ranges from south-central Virginia and southern Illinois to the Florida panhandle and eastern Louisiana. This secretive snake is an excellent burrower, spending much of its time concealed in rotting logs, under bark, stones, leaf litter, pine needles, or burrowed in the soil. The southeastern crowned snake apparently prefers relatively xeric, well-drained soils in pine flatwoods, sandhills and dry hillsides. This snake requires dry habitats with friable soil and sufficient debris for shelter. Females deposit eggs in rotting logs or sawdust piles. The southeastern crowned snake's diet consists of centipedes, spiders, termites, and other small, soft-bodied arthropods. (Wilson, 1995).

Eastern Earth Snake -- *Virginia valeriae valeriae* -- This is a small, highly secretive snake about whose habits much remains unknown. It is sometimes seen on the ground surface following heavy rains, but spends most of its time under leaf litter, logs, warm rocks and stones. Diet consists of earthworms, insects and their larvae, and other small arthropods. Its habitats include: damp, open, deciduous and pine-hardwood forests; abandoned fields; trail and back roads areas; wooded residential areas; forest edge and openings; moist, rocky slopes and hillsides with open canopies. Earth Snakes may congregate in small numbers prior to hibernation in pockets of woodland debris or under large rocks (Behler and King 1979)

Snails

Banded Globe Snail – *Anguispira kochi* – requires steep slopes with bluffs and rock talus. It is generally restricted to limestone areas and can be found buried in soft soil, especially during hibernation. The Banded Globe Snail appears to be extirpated throughout much of its former range, especially in the Bluegrass Counties of Kentucky. Extant colonies are known from the Kentucky River corridor from Frankfort east to the Furnace Mountain Area in Estill County and the species may also persist along the Salt River.

Pine Mountain Disc- *Anguispira rugoderma* is restricted to the cool habitat offered at Pine Mountain. This species utilizes downed logs and does not tolerate forest fires.

Queen Crater Snail – All records for living *Mesodon chilhoweensis* are in McCreary County, with the best populations in the Yahoo Falls area and along Rock Creek south of White Oak Junction. Shells have also been collected from the Tennessee side of Pine Mountain. The Queen Crater is a species of acid woodlands, usually found in mature forests on the steep slopes along rock outcrops or boulder talus areas.

Clifty Covert Snail – *Mesodon wetherbyi* – is known from several scattered locations along the Cumberland and Rockcastle Rivers, the Jellico Mountains, Pine Mountain, and Big South Fork. In Kentucky, its total range includes portions of Laurel, Whitley, Pulaski, and McCreary Counties. Populations are not continuous, and the species is absent from much apparently suitable habitat within its limited range. All sites are located on extremely steep forested slopes adjacent to rock outcrops or boulder talus areas. All but one site is located in sandstone areas.

Wrinkled Button Snail- *Mesomphix rugeli* is abundant in many counties on the southern end of the Daniel Boone. It requires wooded hillsides, and can be readily found under the leaf litter within its distribution.

Glossy Supercoil Snail- *Paravitrea placentula* has been collected on Black and Pine Mountains and is restricted to Letcher, Harlan, and Bell Counties. It appears to require wooded slopes of hillsides and ravines, and may be collected under leaf litter.

Delicate and Cupped Vertigo Snails- Both *Vertigo bollesiana* and *Vertigo clappi* are restricted to Bell and Harlan Counties. They can be found in leaf litter and moss on wooded hillsides within the general forest. *V. bollesiana* has also been recorded from marshes.

FUNGI

Sulfur Shelf – *Laetioporus sulphureus* – Sulfur shelf is a widely distributed fungus. It is a shelf fungus, and grows on decadent or dead oak trees. On the DBNF, it is somewhat uncommon, occurring usually on large oaks near some kind of open space, such as a field, road corridor, or stream.

Common Morel – *Morchellus esculentus* – is a widely distributed species. It is generally found in dry-mesic forest. On the DBNF, the species is widespread, usually found in dry-mesic oak forest on mid to lower slope. The species may be more common than perceived, as it does not produce ascocarps except under the correct condition of moisture and temperature.

LICHENS

Reindeer Lichens – *Cladina* spp. (*cf. rangiferina, subtenuis*) – are widespread in North America, forming the primary ‘vegetation’ in some parts of the tundra. These symbiont organisms are usually found on harsh sites, often dry and sterile. On the DBNF, they are most common on the thin soils of sandstone or conglomerate glades. They may also occur on bare rock or on woody material on the glades. The sites are usually open with little canopy. These lichens do not seem to grow under shrubs or dense tree growth. They are sometimes found on soils that were exposed to high heat during fire events. Large colonies are considered indicative of areas of infrequent fire. Fires destroy these large colonies, but over many years, colonies are reestablished.

PLANTS

Dicots

Mountain Maple – *Acer spicatum* – is a northern and montaine species that requires cool conditions. On the DBNF, the species is restricted to cool ravines, places where air temperatures are below the average ambient temperature.

Blue Monkshood – *Aconitum uncinatum* ssp. *uncinatum* – is a northern species that requires cool temperatures. On the DBNF, the species is restricted to mesic hardwood forest in sandy soil near streams. Most locations are at the southern end of the forest, but one is more northern.

Running Serviceberry – *Amelanchier stolonifera* – is montaine Appalachian species that is found in rocky and sandy soil in dry, open hardwood forest. The only Kentucky record is from the DBNF area. It is located on rocky soils on a limestone ridge in dry open oak-cedar forest.

Cane – *Arundinaria gigantea* – is wide spread in the southeast. However, it seldom occurs in the large ‘cane brake’ communities in which it was once found. It is most abundant in riparian areas, but does form thick patches in upland areas, usually under open canopy forest.

Yellow Screwstem – *Bartonia virginica* – is a coastal plain species commonly found in moist to wet pine savannas. On the DBNF, it occurs, if at all, in streamhead wetlands and slope seeps. It requires constantly moist conditions and no more than moderate shade. There is some taxonomic confusion between this species and *B. paniculata*, which is more common and which definitely occurs on the forest in the habitat described above.

Sweetshrub – *Calycanthus floridanus* (generic) – occurs as var. *glaucus* on the DBNF. Species-habitat relationships are described for that variety below.

Sweetshrub or Carolina Allspice – *Calycanthus floridus* var. *glaucus* – is a southern species found in a variety of habitats, but usually along waterways. It often grows in large colonies. On the DBNF is found on stream terraces, which are well drained and seldom subject to flooding. The overstory is usually open and composed of mixed oak-hardwoods, sometimes with southern yellow pine. One site occurs on the upper portions of a toe slope in oak forest.

American Chestnut – *Castanea dentata* – is far less common today than it once was. A fungal disease introduced from Asia decimated the species in about 30 years. The species sprouts prolifically and sprouts are still found through its range. American chestnut once dominated much of what is now upland oak forest. On what is now DBNF land, American chestnut was found on narrow sandstone and conglomerate ridges along the edge of the escarpment and in the Redbird area. It was associated with chestnut oak. Scarlet and black oaks replaced it on these sites. Today on the DBNF, sprouts are common to scarce on upper slopes and ridges near the escarpment and on portions of the Redbird District. The species grows on acid soils that are generally poor, dry, and located on sites subject to fire. It is believed that fire promoted the species.

Chinquapin – *Castanea pumila* (generic) – The chinquapin occurs in upland hardwood forest. It is usually found on dry sites, and usually under a partially open canopy. On the Daniel Boone National Forest, the species occurs as variety *pumila*. Species-habitat relationships are discussed for this variety below.

Allegheny Chinquapin – *Castanea pumila* var. *pumila* – is found in dry upland oak or oak-yellow pine forests. It usually occurs where midstory and shrub layers are sparse, or the canopy is open. The species is at least somewhat adapted to fire, sprouting readily after fire. It may respond to fire in the way American chestnut and oaks do.

Scarlet Indian Paintbrush – *Castilleja coccinea* – is found in warm season grasslands, open upland hardwood or pine forest and occasionally along roadsides. The species requires moderate to high levels of light. It responds favorably to fire, which helps to maintain the species habitat.

Green-and-gold – *Chrysogonum virginianum* var. *virginianum* – is a species of the eastern US that is found in forests with sandy soils, often on river terraces. On the DBNF, it is found along streams in sandy terrace forest. The habitat is seldom subject to flooding.

Black Cohosh – *Cimicifuga racemosa* – grows in mesic woods throughout its range of much of the eastern North America. It appears to be a moderate calciphile and does best on well-drained soils. On the DBNF, it occurs in mixed mesophytic forest and at the transition from this forest to river floodplain forest. The species will grow in near open conditions, but is usually found in moderate shade. Root diggers have put pressure on populations of this species, but the extent of the collection is unknown. Collection of this species is currently allowed on the DBNF.

Small Enchanter's-nightshade – *Circaea alpina* ssp. *alpina* – is a northern species with a range extending southward along the Appalachian Mountains. It requires cool, moist conditions. On the DBNF, it is found associated with cold air drainage and narrow sandstone hollows with high

shade and humidity. Almost always it is near a stream, but usually out of the floodplain.

White-leaf Leather-flower – *Clematis glaucophylla* – is a southern species. On the DBNF, it occurs associated with sandstone or conglomerate cobble-boulder bars along larger rivers, and at the edge of prairie-like areas.

Stoneroot – *Collinsonia verticillata* – is a southern Appalachian species. The single Kentucky station is in the DBNF area. It occurs on lower slopes in mixed mesophytic forest in the Jellico Mountains area. The species requires moist soil, and moderate shade.

Sweet Fern – *Comptonia peregrina* – throughout most of its range, is associated with open, sterile, sandy ground where it forms dense, low thickets. In this habitat, fires probably helped maintain the habitat. On the DBNF, this species inhabits open cobble/boulder bars along free-flowing rivers. The plants are found rooted deep in the crevices between boulders. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition.

Cumberland Rosemary – *Conradina verticillata* – inhabits open cobble/boulder bars along free-flowing rivers. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition. Scouring also helps to spread pieces of the shrub, which when broken and carried downstream to suitable habitat, often root and establish new populations. Currently, this species does not occur on the DBNF, but habitat for the species may occur on some streams within the Cumberland River drainage.

Beech Drops – *Epifagus virginiana* – Beech drops is found throughout the range of American beech in eastern North America. It is parasitic, deriving nutrients from an association with American beech (*Fagus grandifolia*) roots. The species, to maintain itself, depends on forests that include *Fagus*. These can be upland or lower slope forests.

Yucca-leaved Rattlesnake Master – *Eryngium yuccifolium* – is coastal plain and prairie species associated with moist to wet warm season grassland. It is also found in open, wet yellow pine savanna and moist to wet fields. On the DBNF, it is known from two sites, one, a moist warm season grassland in a powerline right-of-way, and the other in a moist area of an old field. The species requires moderate to high light and moist conditions.

Small-flowered Thoroughwort – *Eupatorium semiserratum* – is a coastal plain species which extends into prairie regions and open forest of the Cumberland Plateau. It is rare in Kentucky and known only from one location on the DBNF. Here it occurs in an open area in an oak-yellow pine forest on well-drained soil.

Mercury Spurge – *Euphorbia mercurialina* – is an Appalachian Plateaus and Mountains species which ranges from Kentucky to Alabama, and by some accounts to the coastal plain of Florida. It is known from just a few locations in Kentucky, and only one on the DBNF. It is found in dry-mesic oak forest and mixed mesophytic forest. The species probably is a weak calciphile.

Box Huckleberry – *Gaylussacia brachycera* – is a central Appalachian species. It occurs in upland yellow pine and yellow pine-oak woods. Yellow pine is present in or adjacent to all sites

on the DBNF. It is also found on sandstone glades and in the upland portions of utility rights-of-way. The species appears to require well-drained, sandy soils. *Gaylussaccia* will grow in closed canopy (yellow pine) conditions if the midstory and shrub layers are more or less absent. On the DBNF, the densest, and apparently the healthiest populations, are found in these sites. It also grows under more open canopy conditions where it is tolerant of thicker midstory and shrub layers. The rhizomes are positioned at the transition between the duff and mineral soil. Fire maintains the general habitat in which it grows. The species is top killed by fire, but does resprout, at least if the duff layer is not removed. Recovery appears to be slower than for other *Gaylussaccia* species or *Vaccinium* species, but with the proper interval and intensity of fire, populations should be maintained while enhancing habitat.

Yellow Gentian – *Gentiana alba (flavida)* – is a prairie species with range extensions into the Appalachian Plateaus. It occurs in open warm season grassland and open oak or oak-yellow pine forest. On the DBNF it occurs in prairie-like areas, dominated by warm season grasses.

Red-disked Sunflower – *Helianthus atrorubens* – is a southern and prairie species commonly occurring in warm season grassland. It also is found in open yellow pine forest. On the DBNF, this species is most abundant in warm season grassland. This habitat in powerline rights-of-way holds most of the DBNF population. Scattered plants and clumps are found in open yellow pine and yellow pine-oak forest. Fire enhances flowering of this species and maintains its habitat.

Goldenseal – *Hydrastis canadensis* – grows in a variety of habitats ranging from well-drained floodplain to mesic cove forest. On the DBNF, it is known from floodplain sites, mixed mesophytic forest, and drier hardwood forest on limestone. It usually occurs in clusters of not more than a few dozen plants, but a few sites have been found with 1000s of plants. The species is a moderate calciphile and does best in well drained soils with ample available moisture. Shade is usually moderate, and the largest colonies have little or no midstory.

American Water-pennywort – *Hydrocotyle americana* – is a northern species that extends south along the Appalachian Mountains. It grows on usually damp sandy soil, often along streams. On the DBNF, it occurs in only one area, on the sandy floodplain of a stream. The overstory is oak-yellow pine and the midstory is sparse.

St. Peter's-wort – *Hypericum crux-andreae* – is a coastal plain species with scattered populations in the interior. The species grows on usually damp sandy soil, in roadside ditches, and in open, wet yellow pine forest. On the DBNF, it occurs in open, wet warm season grassland. These sites were likely forested, but open prior to their current condition.

Butternut or White Walnut – *Juglans cinerea* – is distributed from southern Ontario to the southern Appalachians. In the northern portions of the range, the species is usually found on well-drained floodplains, either in open areas or as part of a forest canopy. To the south, the species also occurs in rich, mesic hollows. As young trees, they are intolerant, require high light. On the DBNF, it is found in both habitat types, but most trees are infected with butternut canker.

Smooth Veiny Peavine – *Lathyrus venosus* – is widespread in eastern North America. It is often found in open dry forest, but may also be found in moist mesic or terrace forest, and sometimes

on stream banks. On the DBNF, it is found in dry-mesic oak and mixed mesophytic forest, often near gaps or other areas of higher light levels.

American Gromwell – *Lithospermum latifolium* – occurs in the northeastern US down through the central Appalachians. It grows in open, dry-mesic forest. On the DBNF, it is usually found on calcareous sites in dry-mesic oak forest or mesic mixed hardwoods.

Fraser's Loosestrife – *Lysimachia fraseri* – is a southern Appalachian Mountains species. It is found in open meadows and along roadsides. On the DBNF, one site is known from open, forested river terrace.

Barbara's Buttons -- *Marshallia grandiflora* – This species inhabits open cobble/boulder bars along free-flowing rivers. The cobble/boulder bars are subject to periodic scouring during high water events. Scouring prevents or retards the establishment of trees in these habitats helping to maintain the open condition. Currently this species is not known from the DBNF, but habitat for it may exist on some streams within the Cumberland River drainage.

Carolina Anglepod – *Matelea carolinensis* – is a coastal plain species with range extensions along the southern Appalachian Plateaus. It grows in moist, open forest, either yellow pine or hardwood, and in sandy old fields and waste areas. On the DBNF, the single station is on a sandy roadside adjacent to open yellow pine-oak forest.

American Cow-wheat – *Melampyrum lineare* var. *pectinatum* – This variety, the one found on the DBNF, has been carried as var. *lineare* on the DBNF based on a literature citation. Medley (1993) argues against this and places all plants in the DBNF area in var. *pectinatum*. This is a coastal plain species. It is found in sandy, open yellow pine forest. On the DBNF, the sole station for the species is from ridgetop dry-xeric oak and oak-yellow pine forest.

Sweet Pinesap – *Monotropsis odorata* – is a central and southern Appalachian provinces species. It is saprophytic, gaining carbohydrate nutrients from associations with soil fungi. The species appears to be associated with ericaceous shrubs and or yellow pine in dry forest. It is usually found in or at the base of dense thickets of *Rhododendron maximum*, *R. catawbiense*, or *Kalmia latifolia*, usually with yellow pine, but sometimes with upland oaks. Populations on the DBNF are found in similar habitat with the exception of one or two which are moist microhabitat associated with shaded cliffs. Fire likely is important to the maintenance of the community in which *Monotropsis* lives and is unlikely to harm the species as it occurs mostly underground except for flowering.

Thread-leaf Sundrops – *Oenothera linifolia* – is a central US species found in sandy grassland and open rocky areas. On the DBNF, the species is found in sandy warm season grassland and on sandstone glades.

Small Sundrops – *Oenothera perennis* – is a midwestern species found in open forest, prairies, meadows and fields. On the DBNF, it is known from open dry-mesic ridge top oak forest. The species requires moderate to full sunlight. It and its habitat are probably enhanced by fire.

Mountain Wood Sorrel – *Oxalis montana* – is a northern species that extends south through the Appalachian Mountains. The species is generally found in rich mesic forest. On the DBNF, the

species is found in deep, shaded hollows under a canopy of mixed mesophytic species. It is frequently found on terraces above small streams.

Kidney-leaf Grass-of-Parnassus – *Parnassia asarifolia* – is a species of the Appalachian and Ozarkian provinces. It is commonly found on stream banks and in boggy habitat. On the DBNF, the few locations are from streamhead wetlands in open yellow pine-oak forest. The species requires constantly moist soil and moderate light.

Mock Orange – *Philadelphus inodorus* var. *grandiflorus* (per Medley, 1993) – is an Appalachian provinces species. It is found along stream banks, on moist soil in open forest, and on cliffs. On the DBNF, the species is found on limestone cliffs and glades.

Gaywings – *Polygala pauciflora* – is a northern species with extend range through the southern Appalachians. It is found in rich moist forest. On the DBNF, one station is known from a mesic ravine in oak-hardwood forest.

Nodding Rattlesnake-root – *Prenanthes crepidinea* – is northern midwest species with disjunct populations to the south. It is found in moist, usually floodplain forest. On the DBNF, all locations are from open, mesic, terrace forest, mixed mesophytic forest, or the transition between them. The plants flower best in open conditions such as forest edge, but occur as vegetative plants in heavier shade.

Wafer Ash or Hop-tree – *Ptelea trifoliata* (as ssp. *trifoliata* var. *trifoliata* per Medley, 1993) – is found in eastern North American. It is found in moist or rich forest. On the DBNF, it is infrequent but locally abundant on limestone outcrops in open dry-mesic forest or along roadsides.

Nettle-leaf Sage – *Salvia urticifolia* – is a species of the central and southern Appalachians. It grows in dry-mesic forest or shrubby areas. The DBNF sites are in open, dry oak woods on limestone.

Sanicle – *Sanicula canadensis* – is widespread across eastern North America. It occurs in dry-mesic to mesophytic forest. On the DBNF, it is locally common, usually occurring in dry-mesic oak and oak-mixed hardwood forest. It also occurs in mixed mesophytic forest, and occasionally in old fields.

Bay Starvine – *Schisandra glabra* – is a piedmont and Gulf coastal plain species with outlying populations along the Mississippi River, the Atlantic Ocean and the Cumberland Plateau. In the main part of its range, the species is found in beech-magnolia forest. Elsewhere it is found on loess soils. The single population in Kentucky, partially located on the DBNF, is on talus slopes below sandstone cliffs in mesic tulip poplar-hemlock-beech-oak forest. While the plant can be high climbing, it will creep along the ground. Light to moderate shade with well-drained soils and ample moisture is needed.

Ovate Catchfly – *Silene ovata* – is uncommon throughout its range. It is found in open oak woods, often on limestone substrates. It grows in light to moderate shade. The DBNF sites are in open oak woods on limestone and appear to have burned in past years. The midstory and shrub layers are thin, and the canopy somewhat open.

Royal Catchfly – *Silene regia* – is rare to uncommon throughout its range. It is found in warm season grasslands or in grassy areas of barrens. No extant populations of the species are present on the forest. There are historical records for it from the southern end of the forest. It requires open, high light conditions, and fire, in addition to maintaining habitat, probably also promotes the species.

Wasioto Rosinweed – *Silphium wasiostense* – is known only from Kentucky and Tennessee. Most populations are in eastern Kentucky, but one or two are known from the Ridge and Valley of Tennessee. Many of the Kentucky populations are on the DBNF. The plant is found on well-drained river terraces in open forest, scattered in open upland oak forest and on lower slopes. It occurs as one or two-leafed plants except in open areas along roadways, utility rights-of-way or stream terraces. In open areas the plants flower, reaching 6-7 feet tall. The species has a deep taproot suggesting is fire tolerant like many of the prairie silphiums. It is probable that fire once maintained habitat for the species-open oak forest or woodland.

Big-flowered Snowbell – *Styrax grandiflorus* – is southern Appalachian Mountains and southeastern coastal plain species. It commonly grows in mixed or deciduous forest in upland locations. There is at least one reliable record for the species in Kentucky from the DBNF area (McCreary County). Here is growing in mixed mesophytic forest on a north aspect above the Cumberland River.

Synandra – *Synandra hispidula* – is more or less distributed along the Ohio River basin and the eastern Cumberland and Tennessee River basins. It is generally found in rich woods, often on limestone or on base rich soils. On the DBNF, most sites are on limestone along intermittent, upland streams, rich lower slopes in mixed mesophytic woods, or on rarely flooded stream terraces in mesophytic forest.

Snowberry – *Symphoricarpos albus* var. *albus* – is a northern species that has a range extension south into the Appalachian provinces. It is found on dry or rocky soil, often of calcareous nature. It is usually found in open or lightly shaded forest, or sometimes in open areas. The DBNF area records are from Estill and Madison counties, all from narrow limestone ridges in open forest or in thickets.

Spiked Hoary-pea – *Tephrosia spicata* – is a southern species with a number of more northern stations. It is commonly found in dry to wet, open yellow pine or yellow pine-hardwood forest, roadsides, clearings and fields. On the DBNF, the species is found on boulder/cobble bars along larger streams and rivers of the Cumberland River drainage. A few sites are known from sandy, sparsely shaded openings on ridges.

Cutleaf Meadow Parsnip – *Thaspium pinnatifidum* – is throughout its range associated with calcareous bedrock including limestone, siltstone, and dolomite. It is a species of moderately shaded forestland. On the DBNF, it is found in open oak or oak-cedar forest on limestone and calcareous siltstone on the Morehead District.

Velvet Bush Pea – *Thermopsis mollis* (generic) – exists as two varieties, a piedmont variety discussed in other habitat associations that is found on in Kentucky, and a montaine variety. The latter occurs in dry-mesic forest on slopes and ridges.

Nettle-leaf Noseburn – *Tragia urticifolia* – is a prairie species with scattered stations eastward. It is commonly found in dry prairies and open (low tree density) rocky areas. It is known to Kentucky from only one site in the DBNF area. Here it occurs on a limestone glade above the Big South Fork River.

Running Buffalo Clover – *Trifolium stoloniferum* – inhabits open grassland, open woodland and the transition area between them. Light shade does not harm the plant. The species throughout its range is a calciphile, i.e., it shows a preference for limestone or otherwise base cation-rich soils. Periodic disturbance such as might have occurred while large ungulates passed through a population appears to benefit the plant. A large population in central Kentucky appears to do best with moderate disturbance from grazing/resting cattle. The sole population within the Daniel Boone NF proclamation boundary occurs in an open field.

Slippery Elm – *Ulmus rubra* – is widespread in eastern and central North America. It is found typically in moist woods such as floodplain forest. On the DBNF, the species is commonly found in floodplain forest, at forest edge along roadsides, and often in mesic hardwood forest on limestone or base rich soils.

Bird's-foot Violet – *Viola pedata* – occurs over most of the eastern US in dry, well-drained soils. On the Daniel Boone NF, it is most frequently encountered along sandy road banks and slopes in open yellow pine or yellow pine-oak forests. High light levels appear to be required by the species. The species also occurs in dry, upland pastures or grassy slopes that have thin vegetation.

Toothache-tree – *Zanthoxylum americana* – is found in much of northern North America south to the Gulf coastal plain. It grows in moist forest and forest edges. On the DBNF, it is infrequent but locally abundant on limestone outcrops in open dry-mesic forest or along roadsides.

Monocots

Wild Agave – *Agave virginica* – occurs in small to large colonies. The plant is a strong calciphile and is usually found on limestone. It is found in crevices in bedrock, in heavy clay or clay loam soils found on limestone. The sites are usually lightly to moderately shaded. In most cases, the species grows where it is well drained. It is often found in glades, at the base of and on cliffs, and in old quarries.

Pond Caric Sedge – *Carex joorii* – is a coastal plain species found associated with areas that remain wet throughout its range, primarily swamps and wet woods. On the DBNF, it is a semi-aquatic species found only in and at the edge of, a few, apparently natural, ponds. These ponds occasionally dry, but the soil remains saturated.

Boott's Sedge – *Carex picta* – is scattered across the forest. It grows in clumps, which over time spreads outward while dying in the center, leaving a doughnut-shaped ring. It was considered uncommon throughout its range until rare plant surveys on the DBNF located many populations. Most of these populations are small with a few plants, but a few are large (0.4-1 ha, 1-2.5 ac). The species appears to survive in heavy shade, but does poorly. It does best under an open canopy with little midstory on slopes. This habitat is probably maintained by fire, especially

since the plant appears to promote fire. The leaves contain a volatile oil, which readily allows even green leaves to burn, and old leaves form a loose mound of fine fuels around the plants.

Caric Sedge – *Carex seorsa* – is a wet forest species with a range over much of the eastern US. It grows in areas that remain wet throughout the year. On the DBNF, it is associated with a few streamhead wetlands and slope seeps. It grows in clumps forming thick to thin mats of vegetation. Shade is usually moderate to light.

Appalachian Spreading Pogonia – *Cleistes bifaria* – ranges from the Appalachian Plateaus to the Piedmont. It is found in a variety of sites ranging from glades to open forest to warm season grassland to streamhead wetlands. It occurs on well-drained substrates (on hummocks in wetlands) usually in open or partially open conditions. The plants can be single or occur in colonies. On the DBNF, it is known from glades, streamhead wetlands, seep slopes, and on road cuts in upland oak forest. Fire enhances flowering and total numbers of plants. Fire probably helps to maintain habitat as well.

Spotted Coralroot – *Corallorhiza maculata* – is mostly a northern species with extensions into the Appalachian Mountains. Its habitat is hardwood forest, but occurs under a variety of conditions. In Kentucky, it is known only from Pine Mountain within the DBNF proclamation boundary. It occurs on dry-mesic oak-hardwood forest in rich soil.

Pink Lady's-slipper – *Cypripedium acaule* – across its range, occurs in acid forests or wetlands (usually sphagnum bogs). On the DBNF, pink lady-slipper is found in upland oak and mixed pine-oak woods, and occasionally on hummocks within seeps and streamhead wetlands. It occurs in light to heavy shade, but does not seem to flower unless in somewhat open conditions. This species responds well to burning. It is not uncommon to find 3-4 dozen plants in flower and as many more in vegetation condition following a fire where only a dozen or so were found before. The species is experiencing collection pressure from root diggers. Digging of this species is not permitted on the DBNF.

Small Yellow Lady's-slipper – *Cypripedium parviflorum* var. *parviflorum* – ranges from Canada to the southern Appalachian Mountains. It is most common to the north. It grows in sphagnum bogs and hemlock- white pine woods northward. On the DBNF, a few sites are known, all from open oak forest on lower slopes.

Wild Yam – *Dioscorea villosa* – is a widespread species, occurring in a variety of forested habitats throughout its range. It occurs as single plants or in small clumps. It appears to be at least a weak calciphile. On the DBNF, it is most frequent in drier oak forest, under moderate to light shade. The tuber produced by the plant is collected for medicinal purposes.

Bearded Skeleton Grass – *Gymnopogon ambiguous* – Bearded skeleton grass is a coastal plain species that generally occurs in dry, sandy, open forest. It may also occur in open grassland. On the Daniel Boone National Forest, it occurs in open warm season grassland and open, sandy ground with or without light forest cover.

Wood Lily – *Lilium philadelphicum* var. *philadelphicum* – occurs from New England to NC and Kentucky. It is found in open, usually dry forest or in open fields or warm season grass areas. On the DBNF, it is known from open yellow pine-oak forest, roadsides, warm season grassland, and

old fields. It requires open conditions and is soon choked out by heavy cover of herbaceous or woody species. Fire maintains its habitat and promotes the plant.

Small-flowered False Hellebore – *Melanthium parviflorum* – The small-flowered false hellebore is a central and southern Appalachian Mountains species. It is associated with moist slopes in mesic hardwood forest. On the DBNF, it is known from a few areas from mixed mesophytic forest.

Wild Lily-of-the-Valley – *Maianthemum canadense* – is a northern North American species with range extensions south along the Appalachian Mountains. It is found in acid, well-drained sites under eastern hemlock and mixed hardwood forest. It is commonly found on rotten logs or hummocks in wet woods. On the DBNF, it is found on lower slopes and upper terraces in eastern hemlock or mixed mesophytic forest. These sites are cool and shady.

Clubspur Orchid – *Platanthera clavellata* – occurs in a wide variety of habitats across its range. On the DBNF, it occurs in streamhead wetlands, in seeps, on streambanks, and in swamps. It is usually found in mucky soil under moderate to heavy shade. The soil in which it occurs is always damp or wet. This species is an alternative host to the endophyte fungus that is the sole fungal associate for white fringeless orchid (*P. integrilabia*). Maintaining this orchid helps to maintain a diverse stock for the fungal symbiont.

Small Purple-fringed Orchid – *Platanthera psycodes* – is a northern species with a range extension south along the Appalachian Mountains. It is found in wet meadows and wet, open forest. On the DBNF, there are tentative records for this species from wet stream terraces under high canopy closed forest. The identity of the plants in question is not certain.

Swamp Wedgscale – *Sphenopholis pensylvanica* – is an eastern US species. It is usually found in swamps or wet forest. On the DBNF, the single locale in McCreary County is on a seepy streambank in mesic forest.

Mosses

Moss – *Brothera leana* – is uncommon throughout its range. It is known from a few sites in the DBNF at the mouths of limestone caves. Cool airflow and moist (at least high humidity) conditions are provided at these locations.

Feather or Log Moss – *Hypnum curvifolium* – has a wide distribution in North America. The species is uncommon to common and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Feather or Log Moss – *Hypnum imponens* – has a wide distribution in North America. The species is common to abundant and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and

boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Juniper Hair Cap Moss – *Polytrichum juniperinum* – is widely spread in North America, Europe and Asia. It is generally found on soil or humus, usually overlying rock. It is generally found in dry woods along trails, or old woods roads, usually on at the edge or on a bank. It is sometimes found in dry pasture or woods. On the DBNF, it is infrequent on ridges in light shade along old woods roads and trails.

Moss – *Syrrhopodon texanus* – is a coastal plains species with disjunct distribution in the Appalachian and Ozarkian provinces. It commonly occurs on moist rotten logs and stumps, on rock and the bark of trees, especially in low ground. On the DBNF, the species is almost always encountered on the back walls of moist, shaded sandstone or conglomerate rockhouses or cliff faces.

Fern Moss or Log Moss – *Thuidium delicatulum* – is a northern US and Canadian species which extends southward in the eastern US to the Gulf coast (and south to northern South America). It is a usually common species in its habitat, which is on moist soil, humus, rocks, or logs in forest or sometimes meadows or fields. On the DBNF, it is most common in mixed mesophytic forest on rocks, logs and soil, but is also found in dry-mesic forest, and rarely in xeric forest. It also occurs on the DBNF in old fields and meadows, sometimes ruderal areas. This species is widely collected for the horticultural industry and in some areas is becoming scarce.

References:

- Baker, M.D. and Michael J. Lacki. 1997. Short-term changes in bird communities in response to silvicultural prescriptions. *Forest Ecology and Management* 96 (1997) 27-36.
- Barbour R.W. 1971. *Amphibians and reptiles of Kentucky*. The University Press of Kentucky, Lexington, KY.
- Behler, J.L. and F.W. King. 1979. *The Audubon Society field guide to North American reptiles and amphibians*. Alfred A. Knopf, New York.
- Conant, R. and J.T. Collins. 1991. *Peterson field guide to reptiles and amphibians: eastern and central North America*. 3rd ed. Houghton Mifflin, Boston.
- Cooperative inventory of endangered, threatened, sensitive and rare species, DBNF, Morehead Ranger District. 1992. The U.S. Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, and Kentucky Department of Fish and Wildlife Resources.
- DeGraff, R. M., and D.D. Rudis. 1986. *New England Wildlife: Habitat, natural history, and distribution*. NE Forest Experiment Station. US Forest Service. General Technical Report NE-108. 481p.
- DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. *Forest and Rangeland Birds of the United States - Natural History and Habitat Use*. USDA Agriculture Handbook 688. 625 pp.

- Gordan, R.E. 1967. *Aneides aeneus*. Cat. Amer. Amphib. Rept.: 30.1-30.2.
- Hamel, Paul B. 1992. Land Manager's Guide to Birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Medley, M.E. 1993. An annotated catalog of the known or reported vascular flora of Kentucky. Unpublished dissertation. University of Louisville. [A reset, reduced type copy from TNC/KSNPC].
- Mengel, R.M. 1965. The Birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581pp.
- Mount, R.H. 1975. The reptiles and amphibians of Alabama, Auburn, AL; Auburn Univ. Agric. Exp. Sta. 347 p.
- Neill, W.T. 1963. *Hemidactylium scutatum*. Cat. Amer. Amphib. Rept.: 2.1-2.2.
- Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky, Lexington, KY. 372pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1992. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Morehead Ranger District. Winchester, KY. 184 pp.
- Wilson, L.A. 1995. Land manager's guide to the amphibians and reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and The U.S. Forest Service, Southern Region, Atlanta, GA.

07/15/2003

Attachment C.

General Forest Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
12-General Forest	Forest Edge	(blank)	BIRD	Cerulean Warbler/ Dendroica caerulea
				Black-throated Blue Warbler/ Dendroica caerulescens
				Eastern Towhee/ Pipilo erythrophthalmus
				Chipping Sparrow/ Spizella passerina
			INSEC	Golden-winged Warbler/ Vermivora chrysoptera
				Diana Fritillary/ Speyeria diana
			MAMM	Rafinesque's Big-eared Bat/ Corynorhinus (Plecotus) rafinesquii
			P-DIC	Sweetshrub/ Calycanthus floridus var. glaucus
		Dense shrub understory	BIRD	Cerulean Warbler/ Dendroica caerulea
				Black-throated Blue Warbler/ Dendroica caerulescens
		Downed Logs		Gray Catbird/ Dumetella carolinensis
				Bewick's Wren/ Thyomanes bewickii altus
		Drainage Good	INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
		Dry	REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
				Southern Five-lined Skink/ Eumeces inexpectatus
		Elevation (above 2300 ft)	BIRD	Cerulean Warbler/ Dendroica caerulea
				Black-throated Blue Warbler/ Dendroica caerulescens
				Chestnut-sided Warbler/ Dendroica pensylvanica
				Golden-winged Warbler/ Vermivora chrysoptera
		Forb/Grass Condition		American Woodcock/ Scolopax minor
				Field Sparrow/ Spizella pusilla
		Mid-age Forest	BIRD	Whip-poor-will/ Caprimulgus vociferus
		Moist		Gray Catbird/ Dumetella carolinensis
				American Redstart/ Setophaga ruticilla
		Open (Little or No Shade)	INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
		Open Forest Canopy	BIRD	Northern Flicker/ Colaptes auratus
				Red-headed Woodpecker/ Melanerpes erythrocephalus
		Rich Soil		Eastern Towhee/ Pipilo erythrophthalmus
				Northern Flicker/ Colaptes auratus
		Rocky/Rocks	REPT	Corn Snake/ Elaphe gutta gutta
		Sandy Soil	INSEC	Appalachian Grizzled Skipper/ Pyrgus wyandot
		Shrub/Sapling Condition	BIRD	Northern Bobwhite/ Colinus virginianus
				Prairie Warbler/ Dendroica discolor
				Yellow-breasted Chat/ Icteria virens
				Eastern Towhee/ Pipilo erythrophthalmus
			REPT	American Woodcock/ Scolopax minor
				Southern Five-lined Skink/ Eumeces inexpectatus
		Snags > 6" dbh	BIRD	Red-headed Woodpecker/ Melanerpes erythrocephalus

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Bewick's Wren/ <i>Thryomanes bewickii altus</i>
		Tree and Snags (Cavity Nesters)		Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i>
				Bewick's Wren/ <i>Thryomanes bewickii altus</i>
		Upland (usually mesic to dry, not subject to holding water)		Whip-poor-will/ <i>Caprimulgus vociferus</i>
	Regeneration area/early seral	(blank)		Gray Catbird/ <i>Dumetella carolinensis</i>
				Kentucky Warbler/ <i>Oporornis formosus</i>
				Golden-winged Warbler/ <i>Vermivora chrysoptera</i>
			P-DIC	Wasioto Rosinweed/ <i>Silphium wasiotense</i>
		Dense shrub understory	BIRD	Gray Catbird/ <i>Dumetella carolinensis</i>
		Dry		Lark Sparrow/ <i>Chondestes grammacus</i>
		Elevation (above 2300 ft)		Golden-winged Warbler/ <i>Vermivora chrysoptera</i>
		Exfoliating bark, (trees dead or alive), trees with broken branches or hollow cavities	MAMM	Indiana Bat/ <i>Myotis sodalis</i>
		Moist	BIRD	Gray Catbird/ <i>Dumetella carolinensis</i>
		Open (Little or No Shade)		Lark Sparrow/ <i>Chondestes grammacus</i>
		Rocky/Rocks		Lark Sparrow/ <i>Chondestes grammacus</i>
		Shrub/Sapling Condition		Chipping Sparrow/ <i>Spizella passerina</i>
				Field Sparrow/ <i>Spizella pusilla</i>
	Woods/Forest (general)	(blank)	AMPHI	Wehrle's Salamander/ <i>Plethodon wehrlei</i>
				Wood Frog/ <i>Rana sylvestris</i>
			BIRD	Canada Warbler/ <i>Wilsonia canadensis</i>
				Hooded Warbler/ <i>Wilsonia citrina</i>
			FUNGI	Morel/ <i>Morchellus esculentus</i>
			GASTR	Wrinkled Button/ <i>Mesomphix rugeli</i>
				Delicate vertigo/ <i>Vertigo bollesiana</i>
			MAMM	Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii</i>
				Eastern Small-footed Bat/ <i>Myotis leibii</i>
				Virginia Big-eared Bat/ <i>Plecotus townsendii virginianus</i>
			P-DIC	Carolina Allspice/ <i>Calycanthus floridanus</i>
				Green-and-gold/ <i>Chrysogonum virginianum</i> var. <i>virginianum</i>
				Black Cohosh/ <i>Cimicifuga americana</i>
				Black Cohosh/ <i>Cimicifuga racemosa</i>
				White-leaf Leather-flower/ <i>Clematis glaucophylla</i>
				Yellow Gentian/ <i>Gentiana alba</i>
				Smooth Veiny Peavine/ <i>Lathyrus venosus</i>
				American Gromwell/ <i>Lithospermum latifolium</i>
				Carolina Anglepod/ <i>Matelea carolinensis</i>
				Nettle-leaf Sage/ <i>Salvia urticifolia</i>
				Ovate Catchfly/ <i>Silene ovata</i>
				Big-flowered Snowbell/ <i>Styrax grandiflorus</i>
				Cutleaf Meadow-parsnip/ <i>Thaspium pinnatifidum</i>
				Running Buffalo Clover/ <i>Trifolium stoloniferum</i>

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Bird's-foot Violet/ Viola pedata
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
				Spotted Coralroot/ Corallorhiza maculata
				Wild Yam/ Dioscorea villosa
				Small-flowered False Hellebore/ Melanthium parviflorum
		Acidic Substrate	AMPHI	Four-toed Salamander/ Hemidactylum scutatum
			P-DIC	Yellow Screwstem/ Bartonia virginica
				Yucca-leaved Rattlesnake Master/ Eryngium yuccifolium
				Box Huckleberry/ Gaylussacia brachycera
				Sweet Pinesap/ Monotropsis odorata
				Mountain Wood Sorrel/ Oxalis monatana
			P-DIC	Kidney-leaf Grass-of-Parnassus/ Parnassia asarifolia
			P-LICH	Reindeer Lichen/ Cladina spp (cf. rangiferina,stellaris,subtenuis)
			P-MON	Pink Lady-slipper/ Cypripedium acaule
				Wood Lily/ Lilium philadelphicum var. philidelphicum
			P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Aspect (SE to NW)	P-DIC	Wasioto Rosinweed/ Silphium wasiotense
			REPT	Southeastern Crowned Snake/ Tantilla coronata
		Aspect (NW to SE)	P-DIC	Stoneroot/ Collinsonia verticillata
				Box Huckleberry/ Gaylussacia brachycera
		Basic Substrate		Cutleaf Meadow-parsnip/ Thaspium pinnatifidum
				Toothache-tree/ Zanthoxylum americana
		Burrows, Holes, Tunnels (Secondary Users)	MAMM	Eastern Spotted Skunk/ Spilogale putorius
			REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
				Northern Pine Snake/ Pituophis melanoleucus melanoleucus
		Closed Forest Canopy	MAMM	Indiana Bat/ Myotis sodalis
		Cold Air Drainage	P-DIC	Small Enchanter's-nightshade/ Circaea alpina ssp. alpina
				Mountain Wood Sorrel/ Oxalis monatana
		Cool Temperatures	GASTR	Pine Mountain Disc/ Anguispira rugoderma
		Dense shrub understory	BIRD	Chestnut-sided Warbler/ Dendroica pensylvanica
				Eastern Towhee/ Pipilo erythrophthalmus
				Bewick's Wren/ Thyomanes bewickii altus
				Canada Warbler/ Wilsonia canadensis
				Hooded Warbler/ Wilsonia citrina
			REPT	Corn Snake/ Elaphe gutta gutta
		Downed Logs	AMPHI	Marbled Salamander/ Ambystoma opacum
				Green Salamander/ Aneides aeneus
				Wehrle's Salamander/ Plethodon wehrlei
			BIRD	Pileated Woodpecker/ Dryocopus pileatus
			GASTR	Pine Mountain Disc/ Anguispira rugoderma
			MAMM	Masked Shrew/ Sorex cinereus cinereus
				Eastern Spotted Skunk/ Spilogale putorius
				Black Bear/ Ursus americanus
			P-MOS	Feather Moss, Log Moss/ Hypnum imponens

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Moss/ Syrrhopodon texanus
			REPT	Northern Scarlet Snake/ Cemphora coccinea copei
				Corn Snake/ Elaphe gutta gutta
				Northern Coal Skink/ Eumeces antracinus anthracinus
				Southern Five-lined Skink/ Eumeces inexpectatus
				Scarlet Kingsnake/ Lampropeltis triangulum elapsoides
				Southeastern Crowned Snake/ Tantilla coronata
				Eastern Earth Snake/ Virginia valeriae valeriae
		Dry	BIRD	Lark Sparrow/ Chondestes grammacus
				Prairie Warbler/ Dendroica discolor
			P-DIC	Running Serviceberry/ Amelanchier stolonifera
				Chinquapin (generic)/ Castanea pumila
				Allegheny Chinquapin/ Castanea pumila var. pumila
				Sweet-fern/ Comptonia peregrina
				Beechdrops/ Epifagus virginianana
				Goldenseal/ Hydrastis canadensis
				St. Peter's-wort/ Hypericum crux-andreae
				Thread-leaf Sundrops/ Oenothera linifolia
				Royal Catchfly/ Silene regia
				Spiked Hoary-pea/ Tephrosia spicata
				Velvet Bush Pea/ Thermopsis mollis (generic)
				Nettle-leaf Noseburn/ Tragia urticifolia
				Bird's-foot Violet/ Viola pedata
			P-MON	Wild Agave/ Agave virginica
				Cane/ Arundinaria gigantea
				Boott's Caric Sedge/ Carex picta
				Appalachian Spreading Pogonia/ Cleistes bifaria
				Bearded Skeleton Grass/ Gymnopogon ambiguus
			P-MOS	Juniper Hair Cap moss/ Polytrichum juniperinum
			REPT	Timber Rattlesnake/ Crotalus horridus
				Southern Five-lined Skink/ Eumeces inexpectatus
				Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
				Northern Pine Snake/ Pituophis melanoleucus melanoleucus
				Southeastern Crowned Snake/ Tantilla coronata
		Elevation (above 2300 ft)	BIRD	Common Raven/ Corvus corax
				Chestnut-sided Warbler/ Dendroica pensylvanica
				Golden-winged Warbler/ Vermivora chrysoptera
				Canada Warbler/ Wilsonia canadensis
			P-DIC	Mountain Maple/ Acer spicatum
		Ericaceous Shrub Associate	INSEC	Diana Fritillary/ Speyeria diana
			P-MON	Pink Lady's-slipper/ Cypripedium acaule
		Exfoliating bark, (trees dead or alive), trees with broken branches or hollow cavities	MAMM	Rafinesque's Big-eared Bat/ Corynorhinus (Plecotus) rafinesquii
				Eastern Small-footed Bat/ Myotis leibii

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Indiana Bat/ <i>Myotis sodalis</i>
		Fire Tolerant/Enhanced	BIRD	Northern Flicker/ <i>Colaptes auratus</i>
				Prairie Warbler/ <i>Dendroica discolor</i>
			INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>
		Forb/Grass Condition	BIRD	Northern Bobwhite/ <i>Colinus virginianus</i>
				Golden-winged Warbler/ <i>Vermivora chrysoptera</i>
			MAMM	Indiana Bat/ <i>Myotis sodalis</i>
				Eastern Spotted Skunk/ <i>Spilogale putorius</i>
		Forest Interior (Minimal Edge)	BIRD	Sharp-shinned Hawk/ <i>Accipiter striatus</i>
				Pileated Woodpecker/ <i>Dryocopus pileatus</i>
				Wood Thrush/ <i>Hylocichla mustelina</i>
		High Shade	INSEC	Sixbanded Longhorn Beetle/ <i>Dryobius sexnotatus</i>
				Diana Fritillary/ <i>Speyeria diana</i>
			P-MON	Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i>
			P-MOS	Feather Moss, Log Moss/ <i>Hypnum curvifolium</i>
		High/Constant Humidity (Microclimate)	REPT	Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i>
		Large Decadent Trees	FUNGI	Sulphur Shelf/ <i>Laetiporus sulphureus</i>
		Leaf Litter	AMPHI	Green Salamander/ <i>Aneides aeneus</i>
				Wehrle's Salamander/ <i>Plethodon wehrlei</i>
			GASTR	Banded Globe/ <i>Anguipira kochi</i>
				Queen Crater/ <i>Mesodon chilhowensis</i>
				Wrinkled Button/ <i>Mesomphix rugeli</i>
				Glossy Supercoil/ <i>Paravitrea placentula</i>
				Cupped Vertigo/ <i>Vertigo clappi</i>
			REPT	Northern Scarlet Snake/ <i>Cemphora coccinea copei</i>
				Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i>
				Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
				Southeastern Crowned Snake/ <i>Tantilla coronata</i>
				Eastern Earth Snake/ <i>Virginia valeriae valeriae</i>
		Low (wet, i.e. subject to holding water)	P-DIC	Sweetshrub/ <i>Calycanthus floridus</i> var. <i>glaucus</i>
				Small Sundrops/ <i>Oenothera perennis</i>
			P-MON	Cane/ <i>Arundinaria gigantea</i>
				Cypress-swamp Caric Sedge/ <i>Carex joorii</i>
				Caric Sedge/ <i>Carex seorsa</i>
		Mature forest	BIRD	Sharp-shinned Hawk/ <i>Accipiter striatus</i>
				Pileated Woodpecker/ <i>Dryocopus pileatus</i>
				Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i>
				Black-and-white Warbler/ <i>Mniotilta varia</i>
		Mid-age Forest		Whip-poor-will/ <i>Caprimulgus vociferus</i>
				Black-and-white Warbler/ <i>Mniotilta varia</i>
				Eastern Towhee/ <i>Pipilo erythrophthalmus</i>
		Moderate Shade	P-MON	Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i>
				Pink Lady-slipper/ <i>Cypripedium acaule</i>

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Small Yellow Lady's-slipper/ <i>Cypripedium parviflorum</i> var. <i>parviflorum</i>
			P-MOS	Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>
		Moist	BIRD	Ruby-throated hummingbird/ <i>Archilochus colubris</i>
			GASTR	Glossy Supercoil/ <i>Paravitrea placentula</i>
				Cupped Vertigo/ <i>Vertigo clappi</i>
			INSEC	Diana Fritillary/ <i>Speyeria diana</i>
			MAMM	Masked Shrew/ <i>Sorex cinereus cinereus</i>
			P-DIC	Mountain Maple/ <i>Acer spicatum</i>
				Yellow Screwstem/ <i>Bartonia virginica</i>
				Scarlet Indian Paintbrush/ <i>Castilleja coccinea</i>
				Beechdrops/ <i>Epifagus virginianana</i>
				Yellow Gentian/ <i>Gentiana alba</i>
				Goldenseal/ <i>Hydrastis canadensis</i>
				American Water-pennywort/ <i>Hydrocotyle americana</i>
				Barbara's Buttons/ <i>Marshallia grandiflora</i>
				Carolina Anglepod/ <i>Matelea carolinensis</i>
				Sweet Pinesap/ <i>Monotropsis odorata</i>
				Small Sundrops/ <i>Oenothera perennis</i>
				Mountain Wood Sorrel/ <i>Oxalis monatanana</i>
				Mock Orange/ <i>Philadelphus inodorus</i>
				Gaywings/ <i>Polygala pauciflora</i>
				Nodding Rattlesnake-root/ <i>Prenanthes crepidinea</i>
			P-MON	Small Yellow Layd's-slipper/ <i>Cypripedium parviflorum</i> var. <i>parviflorum</i>
				Wild Yam/ <i>Dioscorea villosa</i>
				Wild Lily-of-the-Valley/ <i>Maianthemum canadense</i>
				Clubspur Orchid/ <i>Platanthera clavellata</i>
				Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
				Swamp Wedgscale/ <i>Sphenopholis pensylvanica</i>
			P-MOS	Feather Moss, Log Moss/ <i>Hypnum curvifolium</i>
				Feather Moss, Log Moss/ <i>Hypnum imponens</i>
				Moss/ <i>Syrrhopodon texanus</i>
				Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>
		Neutral substrate	P-DIC	Toothache-tree/ <i>Zanthoxylum americana</i>
			P-MON	Boott's Caric Sedge/ <i>Carex picta</i>
		Old Growth Condition	GASTR	Pine Mountain Disc/ <i>Anguispira rugoderma</i>
		Open (Little or No Shade)	BIRD	Lark Sparrow/ <i>Chondestes grammacus</i>
				Prairie Warbler/ <i>Dendroica discolor</i>
			INSEC	Appalachian Grizzled Skipper/ <i>Pyrgus wyandot</i>
				Diana Fritillary/ <i>Speyeria diana</i>
			MAMM	Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii</i>
			P-DIC	Small-flowered Thoroughwort/ <i>Eupatorium semiserratum</i>
				Red-disked Sunflower/ <i>Helianthus atrorubens</i>
				American Cow-wheat/ <i>Melampyrum lineare</i> var. <i>lineare</i>
				Wasioto Rosinweed/ <i>Silphium wasiotense</i>

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Spiked Hoary-pea/ Tephrosia spicata
				Bird's-foot Violet/ Viola pedata
			P-LICH	Reindeer Lichen/ Cladina spp (cf. rangiferina,stellaris,subtenuis)
			P-MON	Wood Lily/ Liliun philadelphicum var. philidelphicum
				Small Purple-fringed Orchid/ Platanthera psycodes
			REPT	Northern Scarlet Snake/ Cemphora coccinea copei
				Corn Snake/ Elaphe gutta gutta
		Open Forest Canopy	BIRD	Northern Flicker/ Colaptes auratus
				Peregrine Falcon/ Falco peregrinus
				Red-headed Woodpecker/ Melanerpes erythrocephalus
			INSEC	Diana Fritillary/ Speyeria diana
			MAMM	Indiana Bat/ Myotis sodalis
				Virgina Big-eared Bat/ Plecotus townsendii virginianus
				Black Bear/ Ursus americanus
			P-DIC	Yellow Screwstem/ Bartonia virginica
				Yucca-leaved Rattlesnake Master/ Eryngium yuccifolium
				Yellow Gentian/ Gentiana alba
				Small Sundrops/ Oenothera perennis
				Royal Catchfly/ Silene regia
				Spiked Hoary-pea/ Tephrosia spicata
				Cutleaf Meadow-parsnip/ Thaspium pinnatifidum
				Velvet Bush Pea/ Thermopsis mollis (generic)
			P-MON	Cane/ Arundinaria gigantea
				Appalachian Spreading Pogonia/ Cleistes bifaria
				Small Purple-fringed Orchid/ Platanthera psycodes
			P-MOS	Juniper Hair Cap moss/ Polytrichum juniperinum
			REPT	Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
				Southeastern Crowned Snake/ Tantilla coronata
		Open Midstory/Understory	BIRD	Sharp-shinned Hawk/ Accipter striatus
			P-DIC	Scarlet Indian Paintbrush/ Castilleja coccinea
				Royal Catchfly/ Silene regia
			P-MON	Wild Yam/ Dioscorea villosa
		Regeneration area/early seral	BIRD	Chestnut-sided Warbler/ Dendroica pensylvanica
				Bewick's Wren/ Thryomanes bewickii altus
				Golden-winged Warbler/ Vermivora chrysoptera
		Remote Habitat		Common Raven/ Corvus corax
			MAMM	Eastern Cougar/ Felis concolor couguar
				Black Bear/ Ursus americanus
		Rich Soil	BIRD	Northern Flicker/ Colaptes auratus
			GASTR	Banded Globe/ Anguispira kochi
			INSEC	Diana Fritillary/ Speyeria diana
			P-DIC	Blue Monkshood/ Aconitum uncinatum ssp. uncinatum
				American Chestnut/ Castanea dentata
				White-leaf Leather-flower/ Clematis glaucophylla

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Goldenseal/ <i>Hydrastis canadensis</i>
				Butternut/ <i>Juglans cinerea</i>
				Mock Orange/ <i>Philadelphus inodorus</i>
				Sanicle/ <i>Sanicula canadensis</i>
				Bay Starvine/ <i>Schisandra glabra</i>
				Ovate Catchfly/ <i>Silene ovata</i>
				Slippery Elm/ <i>Ulmus rubra</i>
		Riparian	MAMM	Masked Shrew/ <i>Sorex cinereus cinereus</i>
			P-DIC	Small-flowered Thoroughwort/ <i>Eupatorium semiserratum</i>
				Nodding Rattlesnake-root/ <i>Prenanthes crepidinea</i>
			REPT	Eastern Slender Glass Lizard/ <i>Ophisaurus attenuatus longicaudus</i>
		Rocky/Rocks	AMPHI	Marbled Salamander/ <i>Ambystoma opacum</i>
				Wehrle's Salamander/ <i>Plethodon wehrlei</i>
			BIRD	Lark Sparrow/ <i>Chondestes grammacus</i>
			GASTR	Queen Crater/ <i>Mesodon chilhowensis</i>
				Glossy Supercoil/ <i>Paravitrea placentula</i>
			MAMM	Eastern Spotted Skunk/ <i>Spilogale putorius</i>
			P-DIC	Mountain Maple/ <i>Acer spicatum</i>
				Running Serviceberry/ <i>Amelanchier stolonifera</i>
				American Chestnut/ <i>Castanea dentata</i>
				Mercury Spurge/ <i>Euphorbia mercurialina</i>
				Fraser's Loosestrife/ <i>Lysimachia fraseri</i>
				Thread-leaf Sundrops/ <i>Oenothera linifolia</i>
			P-DIC	Wafer Ash, Hop-tree/ <i>Ptelea trifoliata</i>
				Royal Catchfly/ <i>Silene regia</i>
				Snowberry/ <i>Symphoricarpos albus</i> var. <i>albus</i>
				Slippery Elm/ <i>Ulmus rubra</i>
				Toothache-tree/ <i>Zanthoxylum americana</i>
			P-MON	Pink Lady-slipper/ <i>Cypripedium acaule</i>
				Swamp Wedgscale/ <i>Sphenopholis pensylvanica</i>
			P-MOS	Moss/ <i>Brothera leana</i>
				Juniper Hair Cap moss/ <i>Polytrichum juniperinum</i>
				Moss/ <i>Syrrhopodon texanus</i>
				Fern Moss, Log Moss/ <i>Thuidium delicatulum</i>
			REPT	Northern Scarlet Snake/ <i>Cemphora coccinea copei</i>
				Corn Snake/ <i>Elaphe gutta gutta</i>
				Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i>
				Southeastern Crowned Snake/ <i>Tantilla coronata</i>
				Eastern Earth Snake/ <i>Virginia valeriae valeriae</i>
		Sandy Soil	AMPHI	Marbled Salamander/ <i>Ambystoma opacum</i>
			P-DIC	Running Serviceberry/ <i>Amelanchier stolonifera</i>
				Chinquapin (generic)/ <i>Castanea pumila</i>
				Cumberland Rosemary/ <i>Conradina verticillata</i>
				Box Huckleberry/ <i>Gaylussacia brachycera</i>

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Fraser's Loosetrife/ <i>Lysimachia fraseri</i>
				Small Sundrops/ <i>Oenothera perennis</i>
			P-DIC	Bird's-foot Violet/ <i>Viola pedata</i>
			P-MON	Pink Lady-slipper/ <i>Cypripedium acaule</i>
			REPT	Northern Scarlet Snake/ <i>Cemphora coccinea copei</i>
				Scarlet Kingsnake/ <i>Lampropeltis triangulum elapsoides</i>
		Seasonal (water)	AMPHI	Jefferson Salamander/ <i>Ambystoma jeffersonianum</i>
				Marbled Salamander/ <i>Ambystoma opacum</i>
				Four-toed Salamander/ <i>Hemidactylum scutatum</i>
				Wood Frog/ <i>Rana sylvestris</i>
		Seep/Constant Water		Green Salamander/ <i>Aneides aeneus</i>
			P-DIC	Kidney-leaf Grass-of-Parnassus/ <i>Parnassia asarifolia</i>
				Synandra/ <i>Synandra hispidula</i>
			P-MON	Clubspur Orchid/ <i>Platanthera clavellata</i>
			P-MOS	Bartlett's Sphagnum Moss/ <i>Sphagnum bartlettianum</i>
				Red Sphagnum/ <i>Sphagnum bartlettianum</i>
		Shrub/Sapling Condition	BIRD	Northern Bobwhite/ <i>Colinus virginianus</i>
				Prairie Warbler/ <i>Dendroica discolor</i>
				Common Yellowthroat/ <i>Geothlypis trichas</i>
				Yellow-breasted Chat/ <i>Icteria virens</i>
				Black-and-white Warbler/ <i>Mniotilta varia</i>
				Eastern Towhee/ <i>Pipilo erythrophthalmus</i>
			INSEC	Diana Fritillary/ <i>Speyeria diana</i>
			P-MON	Wild Yam/ <i>Dioscorea villosa</i>
			REPT	Southern Five-lined Skink/ <i>Eumeces inexpectatus</i>
		Slope (hillside, steepness)	BIRD	Black-and-white Warbler/ <i>Mniotilta varia</i>
			GASTR	Banded Globe/ <i>Anguipira kochi</i>
				Clifty Covert/ <i>Mesodon wetherbyi</i>
				Glossy Supercoil/ <i>Paravitrea placentula</i>
				Cupped Vertigo/ <i>Vertigo clappi</i>
			P-DIC	American Chestnut/ <i>Castanea dentata</i>
				Snowberry/ <i>Symphoricarpos albus var. albus</i>
		Snags > 6" dbh	BIRD	Northern Flicker/ <i>Colaptes auratus</i>
				Red-headed Woodpecker/ <i>Melanerpes erythrocephalus</i>
				Bewick's Wren/ <i>Thryomanes bewickii altus</i>
		Snags, Any Size		Northern Flicker/ <i>Colaptes auratus</i>
		Snags, Large (> 20 in DBH)	FUNGI	Sulphur Shelf/ <i>Laetioporus sulphureus</i>
			MAMM	Black Bear/ <i>Ursus americanus</i>
		Sphagnum Associate	AMPHI	Four-toed Salamander/ <i>Hemidactylum scutatum</i>
		Tract Size (Area Sensitive)	BIRD	Ruby-throated hummingbird/ <i>Archilochus colubris</i>
				Whip-poor-will/ <i>Caprimulgus vociferus</i>
				Pileated Woodpecker/ <i>Dryocopus pileatus</i>
				Wood Thrush/ <i>Hylocichla mustelina</i>
				Yellow-throated Vireo/ <i>Vireo flavifrons</i>

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
		Tree and Snags (Cavity Nesters)		Northern Flicker/ Colaptes auratus
				Pileated Woodpecker/ Dryocopus pileatus
				Red-headed Woodpecker/ Melanerpes erythrocephalus
				Bewick's Wren/ Thryomanes bewickii altus
			MAMM	Eastern Spotted Skunk/ Spilogale putorius
		Trees > 20" dbh	BIRD	Pileated Woodpecker/ Dryocopus pileatus
				Bald Eagle/ Haliaeetus leucocephalus
		Upland (usually mesic to dry, not subject to holding water)		Whip-poor-will/ Caprimulgus vociferus
			P-DIC	Running Serviceberry/ Amelanchier stolonifera
			REPT	Scarlet Kingsnake/ Lampropeltis triangulum elapsoides
				Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus
		Water (Distance Sensitive)	BIRD	Bald Eagle/ Haliaeetus leucocephalus
			MAMM	Indiana Bat/ Myotis sodalis
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
				Eastern Slender Glass Lizard/ Ophisaurus attenuatus longicaudus

07/15/2003

Viability Assessment Report For Rock Outcrops Habitat Association

Prepared by
James W. Bennett
Daniel Boone National Forest

I. Description of the Habitat Association

A. Physical Description

Location of Habitat Association on the Daniel Boone National Forest

Rock outcrops appear in a variety of forms throughout the Daniel Boone National Forest (DBNF) on all administrative Districts. Outcrops generally occur as sandstone, limestone or to a lesser extent mudstone/siltstone/shale rock exposures. These outcrops can take several forms including: exposed rock on the surface of the landscape, glades, talus slopes and, in their most striking appearance, as cliffs. Cliffline associated caves and rockshelters are also found throughout the DBNF and are an important part of this habitat association. Caves that are not associated with clifflines are also part of this habitat association. Additional information regarding cave systems is delineated in the Karst water section of the Lotic Water Habitat Association. Rockshelters, either sandstone or limestone, are overhangs or shallow caves that may include dark zones and are usually located along clifflines throughout the Forest.

Primary Landtype Associations (LTAs) on the DBNF which contain elements of the Rock Outcrop Habitat Association include:

- Central Knobstone Escarpment (221Hb0010)
- Central Cliff (221Hb002)
- North Fork Kentucky Cliffs (221Hb003)
- Northern Escarpment (221Hb004)
- Northern Low Hills/Cliff Transition (221Hb005)
- Northern Cliff/Karst (221Hb006)
- Southern Knobstone Escarpment (221Hc001)
- Southern Knobstone Escarpment Transition (221Hc002)

- Southern Cliff (221Hc003)
- Big South Fork Plateau (221Hc004)
- Rockcastle Hills (221Hc005)
- London-Corbin Plain Transition (221Hc007)
- Northwest Face Pine Mountain (M221Ce001)

Much of the physical and vegetation description for the rock outcrop habitat association was taken from the above landtype association map unit descriptions (USDA, 1997).

Physiographic Position of Habitat Association

This habitat association is located in the Appalachian Plateaus physiographic province. Rock outcrops are found from the highest to the lowest elevations on the Forest (700-2800 feet). Rock outcrops are usually associated with wide to narrow winding ridges between valleys that range from relatively narrow to wide, but usually have steep slopes. Small waterfalls are a common occurrence. Sandstone outcrops including glades, cliffclines, rockshelters and caves are usually found near broad to narrow ridgetops at higher positions on the ridge. Limestone outcrops may occur near ridgetops, but are usually found at mid to lower slope areas. Talus slopes can be found immediately below cliffclines, but can occur at other locations on the landscape. Sandstone and limestone glades are characteristically found on ridges above cliffclines that contain their respective parent material. Mudstone/siltstone/shale rock are usually associated with low ridgetops or toe slopes.

Geology and Soil Types

All the exposed rocks in the DBNF are of sedimentary origin. Rock formations of the Pennsylvanian-age make up most of the exposed rock, but along the western edge of the Forest, Mississippian-age rock is present at the surface (USDA, 1985). The primary geomorphic process for shaping this landscape is water and wind erosion and Karst solution in areas of limestone. Ridges are often capped with resistant sandstone and may or may not have limestone exposed at lower elevations. Some ridgetops are capped with clay shales, siltstone or coal. Cliff formation along valley walls is a result of differential erosion and bedrock block slides.

Soils vary from deep to moderately deep Ultisols, moderately deep Alfisols and moderately deep to shallow Inceptisols. Soil depth ranges from 0 to 40 + inches. Glade communities are normally restricted to xeric shallow soils along the tops of cliffs or rock outcrops. Thin rocky soils accumulate in crevices, on ledges, and along rock margins. Deep soils, up to 40 inches or more can occur immediately adjacent to the base of cliffclines.

Hydrology

Maintenance of moisture and temperature regimes in this habitat association is thought to be a principal concern in maintaining viable populations of indigenous plant and animal species. Soils tend to be moderately well- to well-drained. Cliffclines are often xeric, however waterfalls and/or seeps are also common in this habitat association and create localized hydric communities. Limestone conduits quickly transmit surface water to underground aquifers and limestone cave systems. Limestone caves are unique ecosystems strongly influenced by a lack of light, a stable and high relative humidity, a limited distribution of nutrients and energy, and moderate, relatively stable temperatures. Many of these caves are associated with underground stream systems and are actively undergoing development while other caves are extremely dry (SAMAB, 1996).

Energy Sources

Direct sunlight provides the basic energy source for much of the trophic pyramid associated with the Rock Outcrop Habitat Association. Energy sources for cave systems are only indirectly associated with sunlight. Much of the energy source in caves is brought in from outside sources. Water flowing through caves brings in outside minerals and nutrients. Bats, woodrats and raccoons, through their guano, provide an important source of organic nutrients for other life forms. Cave crickets, found in nearly all caves on the DBNF, live in caves but exit at night to forage on nearby vegetation. Their feces provide another important energy source to caves. Alleghney woodrats bring in vegetation from outside sources that is utilized by other cave creatures.

B. Vegetation Associated with the Habitat Association

Rock outcrops, in their many forms, occur throughout the DBNF on all administrative Districts and from elevations of 700 to 2800 feet. As a consequence of this wide distribution, vegetation associated with this habitat association is extremely varied. Generally, the rock outcrops occur within a mixed mesophytic and Appalachian oak forest and to a very limited extent, northern hardwood forest. At any specific location within this habitat association, existing vegetation depends greatly upon soil depth and type, aspect, slope, local hydrology and in some cases the presence of cold air-flows down-slope from caves. Cliffclines not only form physical transition zones within forested communities, they also delineate vegetation edges in habitat types because of the moisture and soil depth differences between the top and bottom of the cliffline. Oaks and pines are scattered along the tops of sandstone cliffclines with pines becoming more prevalent in the southern parts of the DBNF.

Talus Slopes

On the DBNF these rocky slopes are usually forested and a full spectrum of forest types may occur immediately adjacent to them. These areas tend to be moist and usually have a dense moss covering. Some talus slopes with little or no soil accumulation and very little moisture occur throughout the DBNF as sparsely to non-vegetated rock fields. At these sites vegetation is very limited, but does include lichens and some mosses. Rooted, herbaceous plants occur around the periphery of these bare rock areas.

Glades

Both sandstone and limestone glades are frequently associated with areas along the tops of clifflines. Glades are generally flat to moderately steep with shallow soils. They lack overstory vegetation and are dominated by the herbaceous layer. Like talus slopes, myriad forest types may surround glades. Grasses, forbs or low shrubs form the dominant understory plant community. The plant community in glades is usually composed of xeric species although conditions do exist which allow more mesic grass and forb species to dominate in the understory.

Caves

Limestone and sandstone caves do not support plant communities due to the absence of light. However, cold airflows below limestone caves sometimes help produce conditions, which support what is in fact cave associated vegetation. Examples of species include Canadian yew and mountain woodsorrel.

Sandstone Cliffs and Rockhouses

Shortleaf pine, pitch pine and Virginia pine along with a scattering of oaks form the usual overstory near the tops of sandstone clifflines. Scarlet and chestnut oaks and pignut hickory commonly occur along cliffline tops and may be found below the cliffline as well.

Additional overstory species that commonly occur below sandstone clifflines includes the above tree species and red maple, white, black and northern red oaks. A mixed mesophytic forest often occurs on cool north facing slopes below sandstone clifflines. Overstory species include a mixture of oaks, American beech, sugar maple, yellow poplar, hickories and bigleaf magnolia.

The cliff face itself is extremely xeric and little vegetation exists in this area. Vegetation is typically sparse and consists of lichens and mosses on the rock face with grasses, sedges, ferns and other vascular plants in deeper soils of ledges and crevices. Locally, hydrologic conditions such as waterfalls, seeps and aspect, create a spray cliff or moist cliff habitat utilized by other vascular herbs, mosses, liverworts and algae.

Rockhouses, in a variety of sizes, commonly occur along the base of sandstone clifflines. Because of cliff overhangs and the sheltered condition of the sandstone rockhouse itself, conditions are usually quite xeric. Some herbaceous vegetation, such as the Federally threatened white-haired goldernrod, occur in these dry sites.

Understory species common to sandstone clifflines include grasses, forbs and blueberries along the top and mountain laurel and rhododendron at the base.

Limestone Cliffs and Rockhouses

White, black, chestnut and scarlet oaks along with scattered pignut hickory make up the dominant overstory along the tops of limestone cliffines. Occasionally, shortleaf, pitch or Virginia pine appears along the tops of limestone cliffs. Overstory species found below limestone cliffines include the oaks mentioned above plus sugar maple white ash, yellow poplar, eastern hemlock, bigleaf magnolia, hickories, sweet buckeye and American beech trees. Red maple is common throughout the limestone cliffline area.

The cliff face itself is fairly xeric and little vegetation exists in this area. Vegetation is typically sparse and consists of lichens and mosses on the rock face with grasses, sedges and other vascular plants in deeper soils of ledges and crevices. Locally, hydrologic conditions such as waterfalls, seeps and aspect, create a spray cliff or moist cliff habitat utilized by other vascular herbs, mosses, liverworts and algae.

Rockhouses, in a variety of sizes, occasionally occur along the base of limestone cliffines. Because of cliff overhangs and the sheltered condition of the limestone rockhouse itself conditions are usually xeric to slightly mesic. Some herbaceous vegetation does occur in these dry sites.

Understory species common to limestone cliffines include a wide variety of herbaceous and shrub species along the top and ferns and other shade tolerant, mesic species along the base.

II. Current Status of the Habitat Association on the Daniel Boone National Forest

Cliffines, Rockshelters and Caves

The DBNF contains approximately 3,040 miles of sandstone and limestone cliffines. Rock outcrops must be at least 10 feet tall and 100 feet long to meet the “cliffline” criteria. Summarized below by Ranger District is the total number of DBNF cliffline miles (USDA, 2000).

District	Miles
London	888
Morehead	300
Redbird	547
Somerset	360
Stanton	435
Stearns	510

Known locations exist for thousands of caves and rockshelters with dark zones within the DBNF. These features are usually associated with some type of cliffline formation. Limestone caves and rockshelters occur primarily on the London, Somerset, Stanton and Morehead Ranger District. Sandstone caves and rockshelters are found on all Ranger

Districts. Many caves remain unsurveyed and it is believed that many caves remain, as yet, undetected. Clifflines and caves are coverage layers in the Geographic Information System (GIS).

Cliffines are currently protected by Forest Plan standards and guidelines that provide a buffer zone of “uninterrupted forest canopy” from 100 feet above to 200 feet below the cliffline (USDA 2000). The purpose of this buffer zone is to protect the moisture, temperature and disturbance sensitive habitats for cliffline associated species.

Mudstone, Siltstone and Shale Outcrops

These rock outcrops do not normally occur as cliffs, but rather low, sloping rock exposures. They occur forest-wide, but are most concentrated on the Morehead Ranger District.

Talus Slopes

Talus slopes occur throughout the DBNF and may or may not be associated with cliffines. Specific locations have not been documented in the GIS database, but these features are known to occur on every Ranger District.

Glades

Glades, although uncommon, do occur along the tops of cliffines and some other locations throughout the DBNF. The size of these areas ranges from about 100 feet to around one acre.

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The management goal for the rock outcrop habitat association is to maintain the physical and microclimate conditions that will result in a high likelihood that species within this association will persist on the forest over the planning period.

The strategy to accomplish this goal mainly focuses on maintaining zones of limited disturbance around the habitat association. Additional standards and guidelines (S&G) are also recommended when other protective measures are needed to insure the viability of a particular species associated with this habitat association. The management emphasis here is to protect and enhance biological resources associated with this habitat association.

The desired future condition of this habitat association is a generally undisturbed cliffline face, the area above and below the cliffines and a larger area surrounding biologically significant caves and rockshelters.

A. Habitat Association General Direction and S&G

Management standards within the cliffline zone (Unless otherwise noted, the standards and guidelines are current Forest Plan direction.)

- Clifflines forest-wide will be managed to retain a zone of uninterrupted forest canopy 100 feet slope distance from the uphill edge of the cliffline and 200 feet slope distance downhill from the drip line of the cliff. On a site-specific basis vegetative manipulation can be permitted when the objective is to improve habitat conditions for PETS species.
 - *Rationale: Microclimate conditions (temperatures, humidity, moisture) are important in maintaining viable populations of many species occurring in this habitat association. Management activities are sometimes necessary to maintain or enhance individual PETS species habitats.*
- Activities such as rights-of-way, trails, and scenic vistas may be permitted in the cliffline zone as long as they do not negatively impact PETS species or their potential habitat.
 - *Rationale: Limited use of the cliffline zone may not affect species viability on a site-specific basis.*
- Protective measures such as informational signing, posting sites closed and/or barrier construction may be applied to sites that are receiving resource damage through inadvertent human activity.
 - *Rationale: Human use of site-specific areas may need to be modified or restricted.*
- Management activities concentrating public use in the vicinity of sensitive cliffline areas and cliffline faces would be avoided if detrimental impacts were likely to occur.
 - *Rationale: Site-specific activities need to be evaluated to determine the level of potential inadvertent human impacts to species associated with this habitat association.*

B. Species Specific General Direction and S&G for the Rock Outcrop Habitat Association

Provide seasonal protection for peregrine falcon nest sites (Best science available, KDFWR)

- Peregrine falcon eyrie (nesting) sites will be protected from inadvertent human disturbance between 1 February and 30 June. The size of these areas will be determined with consultation from the Kentucky Department of Fish and Wildlife Resources and will be based on terrain and activities that are known to occur near the nest site.
 - *Rationale: Peregrine falcons are very sensitive to human disturbance of nest sites during the reproductive period. Without special protection of these sites abandonment of nest sites is likely to occur.*

Protect or enhance significant (see Amendment 11, Forest Plan, page 58) hibernation and maternity caves/rockshelters for PETS bats. (Forest Plan direction for Virginia and Rafinesque big eared-bats and the Indiana bat) (Additional species of PETS bats were included in this S&G as best science available measure to insure species viability; Bennett 2001)

- The existing forest cover will be left undisturbed by management activities within 1/4 mile of all known significant colony sites, unless the activity is designed to improve habitat for PETS species
 - *Rationale: Forest habitat near the above sites is highly utilized by bat species and is important to maintaining viable populations.*
- Colony sites will be signed or gated to restrict entry where needed.
 - *Rationale: Hibernation and maternity sites are extremely sensitive to human disturbance. Population viability can be negatively affected by continued human use of certain sites.*
- Camping and fire building will be prohibited in or near posted colony sites.
 - *Rationale: Camping in specific areas may serve to invite unwanted, inadvertent use of areas important to maintaining species viability. Smoke associated with campfires may be drawn into caves and cause bats to awaken from hibernation or abandon maternity sites.*
- Sites providing potential (undocumented) habitat for maternity, bachelor, or winter colonies of PETS bats will be managed according to guidelines established for the cliffline zone.
 - *Rationale: Many caves likely remain undetected or unreachable in the cliffline zone. These sites may or may not contain hibernation or maternity bat colonies. The cliffline zone will provide a 300 foot wide protection zone for all cliffline associated caves on the forest.*
- Acquire private lands with known hibernacula or maternity sites from willing sellers.
 - *Rationale: The need for protecting significant bat hibernacula is identified in several bat recovery plans.*
- Acquire private lands located near significant hibernacula and maternity sites from willing sellers.
 - *Rationale: Bats heavily utilize the forest community near hibernation and maternity sites.*

Maintain and protect roost tree and foraging/swarming habitat around significant (see Amendment 11, Forest Plan, page 58) hibernation, staging and maternity sites for PETS bats. (Unless otherwise noted, the S&G are current Forest Plan direction.)

- Overstory tree removal will not be proposed if this activity would result in more than 120 acres of forest less than 10 years in age on all ownerships (public and private) within 1 mile of a known significant hibernacula, maternity colony or staging cave of a PETS bat.
 - *Rationale: The mature forest community is important to foraging bats particularly near significant colony sites. (Forest Plan direction for the Indiana bat) (recommendation by Lacki, 1994 and 1999, for big eared bats)(other PETS bats included as a best available information, Bennett 2001)*
- Within five miles of known significant Indiana bat hibernacula, tree-cutting activities will not be conducted between 1 September and 1 December. Suitable roost trees that are 6" dbh or greater may be removed, without checking for bats, from 2 December thru 31 March.
 - *Rationale: During the fall swarming period Indiana bats frequently forage up to five miles from their hibernation caves. Maintaining relatively undisturbed habitat conditions during this period is important to the buildup of fat reserves prior to hibernation. During the hibernation period bats will not be utilizing roost trees.*
- Prescribed burning will not occur within five miles of a significant Indiana bat hibernacula between 1 September and 1 December.
 - *Rationale: During the fall swarming period Indiana bats frequently forage up to five miles from their hibernation caves. Maintaining relatively undisturbed habitat conditions during this period is important to the buildup of fat reserves prior to hibernation. (best science available, USFWS 2001)*
- Tree cutting activities, involving currently suitable or potential suitable Indiana bat roost trees, will not be conducted within two and one half miles of an Indiana bat maternity colony between 1 May and 15 August.
 - *Rationale: Female Indiana bats frequently forage up to 2 ½ miles from their maternity colony site. Tree cutting activity in this area during the maternity period decreases their chance to successfully raise their young. (USFWS current best available knowledge)*

Maintain, protect and enhance habitat for the white-haired goldenrod. (Unless otherwise noted, the S&G are current Forest Plan direction.)

- Management activities that would concentrate public use in the vicinity of white-haired goldenrod recovery areas will be avoided if detrimental impacts are likely to occur because of human activity.
 - *Rationale: Site-specific activities need to be evaluated to determine the level of potential inadvertent human impacts to white-haired goldenrod in this habitat association.*
- Camping and fire building will be prohibited within sites designated for white-haired goldenrod recovery.
 - *Rationale: Camping or fire building in specific areas may serve to invite unwanted use of areas important to maintaining species viability.*
- Designated sites may be signed or fenced as needed to restrict human entry.
 - *Rationale: White-haired goldenrod sites are extremely sensitive to human disturbance by trampling. Population viability can be negatively affected by continued human use of certain sites.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

1. Conduct systematic inventories of selected bat hibernation caves (hibernacula) on the Forest. (High Priority)
 - *Rationale: Follows bat recovery plan direction and provides a measure of whether or not species viability is being maintained.*
2. Monitor cliffline microclimates to ensure that leave zones are maintaining stable microclimate conditions for species associated with this community. (Medium Priority)
 - *Rationale: The width of the cliffline zone is based upon the need to maintain microclimate conditions. Monitoring of temperature and humidity levels after project completion will provide information for comparison with baseline levels.*
3. Monitor Retention of Immediate Roost Trees within Project Areas. (Medium Priority)
 - *Rationale: These trees must be identified prior to project initiation and their retention is important to maintaining habitat suitable for Indiana bat use.*

References Cited:

SAMAB, Southern Appalachian Man and the Biosphere. 1996. The Southern Appalachian Assessment Terrestrial Technical Report. Report 5 of 5. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta, GA. 287 pp.

USDA Forest Service. 1985. Draft Environmental Impact Statement for the Daniel Boone National Forest Land and Resource Management Plan. Daniel Boone National Forest, Winchester, KY

USDA Forest Service. 1997. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest, Winchester, KY

USDA Forest Service. 2000. Environmental Assessment for Amending the Daniel Boone National Forest Land and Resources Management Plan: The SHNS Amendment. Daniel Boone National Forest, Winchester, KY. 173 pp.

Attachment A.

Species List: Rock Outcrops Habitat Association

Class	Common Name/ Species
ANIMALS	
Amphibians	Green Salamander/ <i>Aneides aeneus</i> Wehrle's Salamander/ <i>Plethodon wehrlei</i>
Birds	Common Raven/ <i>Corvus corax</i> Peregrine Falcon/ <i>Falco peregrinus</i>
Insects	Cliff Caddisfly/ <i>Manophylax butleri</i> Exotic Cave Beetle/ <i>Pseudanophthalmus exoticus</i>
Mammals	Rafinesque's Big-eared Bat/ <i>Corynorhinus (Plecotus) rafinesquii</i> Virginia Big-eared Bat/ <i>Corynorhinus (Plecotus) townsendii virginianus</i> Southeastern myotis/ <i>Myotis austroriparius</i> Gray Bat/ <i>Myotis grisescens</i> Eastern Small-footed Bat/ <i>Myotis leibii</i> Indiana Bat/ <i>Myotis sodalis</i> Allegheny Woodrat/ <i>Neotoma magister</i> Eastern Spotted Skunk/ <i>Spilogale putorius</i>
Reptiles	Timber Rattlesnake/ <i>Crotalus horridus</i> Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i> Eastern Earth Snake/ <i>Virginia valeriae valeriae</i>
Snails	Banded Globe/ <i>Anguispira kochi</i> Queen Crater/ <i>Mesodon chilhoweensis</i> Estill Mesodon/ <i>Mesodon estillensis</i> Clifty Covert/ <i>Mesodon wetherbyi</i> Pupilids/ Pupillidae
PLANTS	
Dicots	Cumberland Sandwort/ <i>Arenaria cumberlandensis</i> Black Cohosh/ <i>Cimicifuga americana</i> French's Shooting Star/ <i>Dodecatheon frenchii</i> Lucy Braun's White Snakeroot/ <i>Eupatorium (Ageratina) luciae-brauniae</i> Box Huckleberry/ <i>Gaylussacia brachycera</i> Cow Wheat/ <i>Melampyrum lineare</i> Appalachian Sandwort/ <i>Minuartia glabra</i> Florida Pellitory/ <i>Parietaria floridana</i> Mountain Lover/ <i>Paxistima canbyi</i>

	Mock Orange/ <i>Philadelphus inodorus</i>
	Wafer Ash, Hop-tree/ <i>Ptelea trifoliata</i>
	Bay Starvine/ <i>Schisandra glabra</i>
	White-haired Goldenrod/ <i>Solidago albopilosa</i>
	Harris's Goldenrod/ <i>Solidago harrissii</i>
	Riverbar Goldenrod/ <i>Solidago spathulata</i>
	Snowberry/ <i>Symphoricarpos albus</i> var. <i>albus</i>
	Roundleaf Fameflower/ <i>Talinum teretifolium</i>
	Little Mountain Meadow Rue/ <i>Thalictrum mirabile</i>
	Nettle-leaf Noseburn/ <i>Tragia urticifolia</i>
Ferns	Wall rue Spleenwort/ <i>Asplenium ruta-muraria</i>
	Southern Bog Club-moss/ <i>Lycopodiella appressa</i>
	Filmy Fern/ <i>Trichomanes boschianum</i>
	Appalachian Gametophyte Fern/ <i>Vittaria appalachiana</i>
Gymnosperms	Ground Juniper/ <i>Juniperus communis</i> var. <i>depressa</i>
	Eastern Redcedar/ <i>Juniperus virginiana</i> var. <i>virginiana</i>
	Pitch Pine/ <i>Pinus rigida</i>
	Canada Yew/ <i>Taxus canadensis</i>
	Northern White Cedar/ <i>Thuja occidentalis</i>
Liverworts	Liverwort/ <i>Jubula pensylvanica</i>
	Austin's Leafy Liverwort/ <i>Plagiochila austinii</i>
	Sullivant's Leafy Liverwort/ <i>Plagiochila sullivantii</i>
	A liverwort/ <i>Radula sullivantii</i>
Monocots	Wild Agave/ <i>Agave virginica</i>
	Ofer Hollow Reed Grass/ <i>Calamagrostis porteri</i> ssp. <i>insperata</i>
	Porter's Reed Grass/ <i>Calamagrostis porteri</i> ssp. <i>porteri</i>
	Loesel's Twayblade/ <i>Liparis loeselii</i>
	Plains Muhlygrass/ <i>Muhlenbergia cuspidata</i>
Mosses	Sword Moss/ <i>Bryoxiphium norvegicum</i>
	Feather Moss, Log Moss/ <i>Hypnum curvifolium</i>
	Streamside Mnium/ <i>Mnium hornum</i>
	Cataract Metal Moss/ <i>Scopelophila cataractae</i>
	Moss/ <i>Syrrhopodon texanus</i>
	Tortula/ <i>Tortula norvegica</i>

Attachment B.

Rock Outcrops Species/Habitat Relationships with References

ANIMALS

Amphibians

Green Salamander – *Aneides aeneus* – The green salamander lives in damp crevices in shaded rock outcrops and ledges. In cove hardwoods, this salamander can be observed under bark and cracks of trees (Gordan, 1967). In the general forested area, the green salamander occurs in mucky, boggy water among decaying leaves and logs around woodland streams and ponds (website. Biodiversity. Wku.edu). The green salamander has also been observed in upland pine areas, Virginia pine and white pine-hemlock with mountain laurel occupying the understory. Moist outcrops are required for egg depositing and larval development. (Wilson, 1995).

Wehrle's Salamander – *Plethodon wehrlei* – The Wehrle's salamander is found in the Appalachian Mountains from extreme southwestern New York southward through Pennsylvania, southeastern Ohio, West Virginia, and Virginia to Stokes County, North Carolina. A disjunct enclave occurs along the Kentucky-Virginia-Tennessee border. Wehrle's salamander is commonly found on wooded hillsides where it hides under rocks and less frequently under and within logs. It has been found near cave entrances, within deep rock crevices and in old second growth, mixed deciduous and coniferous forests. Wehrle's salamander requires moist wooded hillsides with surface debris in the form of rocks, logs and leaf litter. In early summer, the female will deposit a small cluster of eggs in damp logs, soil, or moss. She will remain with the eggs until they hatch. This salamander's diet consists of small invertebrates, especially insects, spiders and earthworms. (Wilson, 1995)

Reptiles

Timber rattlesnake – *Crotalus horridus* – The timber rattlesnake occurs from central Vermont to Iowa in the north and northern Florida to eastern Texas in the south. This rattlesnake inhabits a variety of habitats. In the mountains and foothills it prefers moderately steep, rocky ridge tops with light ground cover. During the fall and spring, timber rattlesnakes are frequently found around rocky ledges with southern exposure. Additional habitats include sphagnum swamps, agricultural fields and second growth clearings. Rock outcrops, old buildings or logs are necessary for winter denning. The timber rattlesnake feeds primarily on small mammals, as well as an occasional bird, amphibian or snake (Mount, 1975; Wilson, 1995).

Northern Coal Skink – *Eumeces anthracinus anthracinus* – The Appalachian population of this subspecies extends into eastern KY, while a disjunct population occurs in the west-central part of the State. Suitable habitat includes damp forests of oak, oak-poplar, oak-hickory-pine, and mixed pine-hardwood with moist soils, abundant leaf litter, logs, and/or loose stones; humid wooded or rocky hillsides; rocky bluffs; and similar areas near water sources, such as streams, springs, swamps, and bogs. These skinks seek the cover of rocks, logs, stumps, brush, and rock slabs. When pursued, they will take refuge in shallow water, hiding under rocks at the bottom. Various

rocky areas in which they have been found include: on limestone ledges; in dry leaves beneath rock ledges; beneath flat slabs of sandstone; under rocks in sunlit forest openings and in grassy cut over areas in hardwoods; and under rocks in the slope of a road cut through a mixed forest (VA Dept. of Game and Inland Fisheries 2001). Use of fire to maintain grassy openings within forested stands is of benefit to this species. Coal Skinks feed primarily on insects and spiders.

Eastern Earth Snake – *Virginia valeriae valeriae* – This is a small, highly secretive snake about whose habits much remains unknown. It is sometimes seen on the ground surface following heavy rains, but spends most of its time under leaf litter, logs, warm rocks and stones. Diet consists of earthworms, insects and their larvae, and other small arthropods. Its habitats include: damp, open, deciduous and pine-hardwood forests; abandoned fields; trail and back roads areas; wooded residential areas; forest edge and openings; moist, rocky slopes and hillsides with open canopies. Earth Snakes may congregate in small numbers prior to hibernation in pockets of woodland debris or under large rocks (Behler and King 1979).

Birds

Common Raven – *Corvus corax* – This species is typically found at elevations above 3500 feet but may occur down to 1500 feet (Hamel, 1992). Typically utilizes rocky and remote cliffline for nesting and is rarely found in areas without rocky outcrops. In Kentucky, they are typically birds of remote places and are rarely seen away from extensively forested portions of the mountains (Palmer-Ball, 1996). In Kentucky, this species is more typical of the high elevation areas along Pine and Black Mountain.

Peregrine Falcon – *Falco peregrinus* – Historically, this species likely inhabited clifflines in the Cumberland Mountains and cliffs section of the Cumberland Plateau, as well as bluffs along the Kentucky and Ohio Rivers and hollow trees of cypress swamps in Western KY (Palmer-Ball, 1996). Mengel mentions observing the presence of nesting peregrine falcons in cliffs overlooking the Rockcastle River (1965). The birds nest only in remote sandstone or limestone cliffs that have ledges. Foraging is in open areas with a mix of forest and fields. Reintroduction efforts in the state, primarily on tall buildings in urban areas but also on cliffs on the Stanton R.D. are increasing Kentucky populations of falcons, which were decimated by the effects of DDT.

Insects

Cliff Caddisfly – *Manophylax butleri* – a caddisfly recently described from West Virginia and Kentucky, is the most terrestrial caddisfly known. It is restricted to exposed sandstone rock walls that are moist to the touch or have a very thin film of water on their surfaces. These sites may be consistently moist or may be moist for only a few weeks of the year. While *M. butleri* has been collected from rock surfaces adjacent to streams, most sites on the Daniel Boone are along sandstone cliffline that is not associated with surface water. The hydrology of these sites are maintained by the shading presence of dense woody vegetation in the adjacent forest.

The cave beetle – *Pseudanopthalmus exoticus* – is known from a single cave on Pine Mountain. It is presumed to be endemic to that cave, however much limestone exists on Pine Mountain that has not been checked that may contain suitable caves. Cave beetles depend on organic debris

within the cave. This can include the eggs of cave crickets or animal feces. For this species to persist, cave hydrology and nutrient flow must be preserved.

Mammals

Rafinesque's Big-eared Bat – *Corynorhinus (Plecotus) rafinesquii rafinesquii* – The Rafinesque's big-eared bat is a year-round resident throughout the DBNF. During the summer it forages in a variety of forested habitats and in forest edges and open areas. During the day it will roost in limestone and sandstone rockhouses and caves, in hollow trees and under exfoliating bark. During the summer males tend to be solitary roosters while females form maternity colonies. Several maternity colonies, usually associated with cliffline caves and rockhouses, occur on the forest. This species is insectivorous and feeds primarily on moths. Foraging sites often occur along clifflines or ridgelines in an oak-hickory habitat. Cliffline associated rock shelters are used as feeding sites. Clifflines are also thought to provide travel corridors for the Rafinesque's big-eared bat. During the summer this species normally forages within about one mile of the roost site. Hibernation sites occur mainly in caves, but some sites occur in rockshelters and in large cracks in sandstone cliffline. This species is very sensitive to human disturbance of both its hibernation and maternity colony sites.

Virginia Big-eared Bat – *Corynorhinus (Plecotus) townsendii virginianus* – The Virginia big-eared bat is a year-round resident on the northern half of the DBNF. Foraging habitat occurs in many different forest overstory types, but is commonly associated with sandstone and limestone clifflines and ridgetops. This species also forages over grassy forest openings (old fields) and along forest edge. Forest openings may provide uncluttered foraging space where preferred prey species occur and can be more easily captured. Sandstone rockshelters and small caves are utilized as temporary feeding roosts. In the summer female and young Virginia big-eared bats form nursery colonies while males are ordinarily solitary although some bachelor colonies do occur. Maternity colonies usually roost near the entrance of rockshelters or caves at the edge of the light zone. Thus, they are very susceptible to human disturbance. Food habits consist primarily of small moths, but also include butterflies, flies and beetles. Forest canopy around roost sites may provide important protection from potential predators such as owls. Virginia big-eared bats hibernate in large clusters in a few limestone caves on the DBNF. As in the summer, they are highly susceptible to human disturbance and may abandon a colony site after repeated human intrusion. Maintaining stable microhabitat conditions and forested communities around the maternity and hibernation caves is important to maintaining these sites.

Southeastern Myotis – *Myotis austroriparius* – The Southeastern myotis rarely occurs on the DBNF which is considered to be on the very edge of the species range. This species utilizes limestone caves for hibernation and is difficult to detect because of its habit of wedging itself far back in cracks and crevices in the ceilings and walls of caves. The Southeastern myotis roosts almost exclusively in caves during the winter and some cave use occurs in the summer. These bats also use hollow trees as summer and maternity roosts. Foraging areas are usually over riparian habitat bordering streams, lakes and ponds. Aquatic insects such as small beetles, moths and mosquitoes form the basis of the food species for the Southeastern myotis.

Eastern Small-footed Bat – *Myotis leibii* – The eastern small-footed bat likely occurs in forested areas throughout the DBNF. Foraging habitat is often associated with riparian areas, but may

occur elsewhere in the forest or forest edge. Summer roosting habitat includes caves, under rocks, bridges (in expansion joints), hollow trees and under exfoliating bark. Food habits are thought to be almost exclusively flying insects associated with riparian habitats. Reproducing females have been found in Eastern Kentucky, but the species is believed to be most common on the DBNF during the winter. Winter hibernation often occurs in relatively cold areas of low humidity just within the entrance of caves or mines. Thus, the eastern small-footed bat may be vulnerable to freezing in severe winters and to human disturbance. The species also hibernates in rock shelters and in fissures within cliff lines.

Gray Bat – *Myotis grisescens* – No large hibernating, bachelor or maternity colonies of gray bats are currently known to exist on the DBNF. Gray bats have been observed in small numbers in caves and in riparian forest areas at several locations on the forest. Gray bats roost in limestone caves year-round, but seasonally they may utilize different caves during the summer and winter. They may migrate between caves or sometimes can be considered as residents of a relatively small area. Gray bats feed almost exclusively over water in riparian forest areas. Emerging aquatic insects such as beetles, moths, mayflies, stoneflies and caddisflies make up the bulk of their diet.

Indiana Bat – *Myotis sodalis* – The DBNF is known to support both winter and summer colonies of the Indiana bat. During the non-hibernation season Indiana bats are likely to occur throughout the DBNF. Some males periodically roost in caves during the summer, but most, along with females, roost under exfoliating bark or in hollow cavities in a variety of dead and alive trees. Roost trees with some sun exposure seem to be preferred because they are warmer. Indiana bats forage for insects in a wide variety of forest habitats ranging from riparian corridors to upland oak to higher elevation ridgetops. Forest canopy ranges from relatively closed to fairly open and Indiana bats sometimes forage in and near grass areas at the forest edge. An open forest understory enhances the bats ability to navigate within the forest stands. Available water in the form of shallow waterholes or ponds enhances general habitat suitability and utilization. Maternity populations are known to exist on the DBNF. Female Indiana bats are known to use multiple roost trees during the lactation period and may forage and roost up to 2 ½ miles from their primary roost trees. During the winter Indiana bats hibernate in several cool/cold limestone caves on the DBNF. These bats gather in large clusters on cave ceiling and need protection from human disturbance during this time of year. Significant hibernation caves occur on the Stanton, London and Somerset Ranger Districts. Hibernation caves are most often, but not always, associated with limestone cliff lines. Maintaining forest canopy around hibernation caves helps maintain microclimate conditions and provides nearby roosting and foraging habitat, particularly during the fall swarming season.

Allegheny Woodrat – *Neotoma magister* – Allegheny woodrats are found throughout the DBNF in forested habitats associated with sandstone or limestone cliff lines. Woodrats find shelter in crevices and caves associated with these cliff lines. A variety of forest types provide the overstory in the woodrat's generally shady foraging habitat adjacent to cliff lines. Woodrats forage on several different types of hard mast, but have a preference for acorns from numerous oak species.

Eastern Spotted Skunk – *Spilogale putorius* – It is likely that the eastern spotted skunk occurs in low population numbers in the general forest area throughout the DBNF. It is often associated

with rocky areas and cliffines. This species prefers forest borders and brushy fields and avoids heavy timber. Forest openings offer a good combination of preferred habitat types. Natural cavities in cliffines, down logs and hollow snags provide shelter and den sites. They also use abandoned underground burrows of other species as den sites. Several skunks may den together in the winter, but they do not hibernate. Eastern spotted skunks forage for food throughout their habitat and are omnivorous. Food items include beetles, small rodents, ground dwelling birds, eggs, lizards, snakes salamanders mushrooms and fruit.

Snails

Banded Globe Snail – *Anguispira kochi* – requires steep slopes with bluffs and rock talus. It is generally restricted to limestone areas and can be found buried in soft soil, especially during hibernation. The Banded Globe Snail appears to be extirpated throughout much of its former range, especially in the Bluegrass Counties of Kentucky. Extant colonies are known from the Kentucky River corridor from Frankfort east to the Furnace Mountain Area in Estill County and the species may also persist along the Salt River.

Queen Crater Snail – All records for living *Mesodon chilhoweensis* are in McCreary County, with the best populations in the Yahoo Falls area and along Rock Creek south of White Oak Junction. Shells have also been collected from the Tennessee side of Pine Mountain. The Queen Crater is a species of acid woodlands, usually found in mature forests on the steep slopes along rock outcrops or boulder talus areas.

Estil Mesodon -- *Mesodon estillensis* sp. nov., is an undescribed species recently discovered in Estill County, KY. It is commonly found in and around the limestone cliffline, especially in moist crevices and small caves. They are rarely found away from the cliffline. The distribution of this species is not yet known, but it appears to be restricted to within several miles of Happy Top Mountain.

Clifty Covert Snail – *Mesodon wetherbyi* – is known from several scattered locations along the Cumberland and Rockcastle Rivers, the Jellico Mountains, Pine Mountain, and Big South Fork. In Kentucky, its total range includes portions of Laurel, Whitley, Pulaski, and McCreary Counties. Populations are not continuous, and the species is absent from much apparently suitable habitat within its limited range. All sites are located on extremely steep forested slopes adjacent to rock outcrops or boulder talus areas. All but one site is located in sandstone areas.

Pupillids – The family *Pupillidae* contains a group of small (less than ¼ in. long) snails. On the Daniel Boone, these snails are most often found in open limestone areas such as cedar glades. This group appears to require sunlight and individuals can often be found in thin leaf litter, the bare areas at the base of cedar trees, on bare rock, or within the fine soil or moss mats that covers these exposed areas.

PLANTS

Dicots

Lucy Braun's White Snakeroot – *Ageratina (Eupatorium) luciae-brauniae* – is endemic to the Cumberland Plateau of Kentucky, including the DBNF, and Tennessee. In Kentucky (and on the

DBNF), it is restricted to the Cumberland River drainage. Throughout its range, the habitat is damp to wet sandstone or conglomerate rockhouses along sandstone cliffs. It usually grows in sandy soil on the rockhouse floor, but may also grow in crevices on the rockhouse wall. Observations have shown that the species is sensitive to direct sunlight, the plants becoming burned and stunted. A shading canopy in front of the shelter appears to be necessary.

Cumberland Sandwort – *Arenaria cumberlandensis* – is known from a very limited distribution in the Big South River drainage of Kentucky and Tennessee. It grows on wet to damp sandstone or conglomerate, in shaded rockhouses or on shaded cliff faces. One site, now extirpated is known from the DBNF. Habitat is present in many areas of the forest within the drainage. Several sites are known nearby on NPS land.

French's Shooting Star – *Dodecatheon frenchii* – is a mid-western species with several stations in Kentucky. The species is found on dry sandstone or conglomerate cliffs or in the dry rockhouses associated with them. On the DBNF, the two known sites are in dry sandstone rockhouses at the northern end of the forest.

Box Huckleberry – *Gaylussacia brachycera* – is a central Appalachian species. It occurs in upland yellow pine and yellow pine-oak woods. Yellow pine is present in or adjacent to all sites on the DBNF. It is also found on sandstone glades and in the upland portions of utility rights-of-way. The species appears to require well-drained, sandy soils. *Gaylussacia* will grow in closed canopy (yellow pine) conditions if the mid-story and shrub layers are more or less absent. On the DBNF, the densest, and apparently the healthiest populations, are found in these sites. It also grows under more open canopy conditions where it is tolerant of thicker mid-story and shrub layers. The rhizomes are positioned at the transition between the duff and mineral soil. Fire maintains the general habitat in which it grows. The species is top killed by fire, but does re-sprout, at least if the duff layer is not removed. Recovery appears to be slower than for other *Gaylussacia* species or *Vaccinium* species, but with the proper interval and intensity of fire, populations should be maintained while enhancing habitat.

American Cow-wheat – *Melampyrum lineare* (generic) – has a somewhat confused taxonomy with numerous uses by various authors. Following Medley (1993), only the var. *pectinatum* is likely to present on the DBNF. Specimens not identified to variety from the DBNF area are assumed to be this variety. Habitat details for the variety are described in other habitat associations.

Appalachian Sandwort – *Minuartia glabra* – is an Appalachian Mountains and Plateaus species. It is associated with sandstone outcrops, glades and cliffs. On the DBNF, it is known from open, dry, sandstone cliffs and glades.

Florida Pellitory – *Parietaria floridana* – is a southern species with disjunct occurrences in the Appalachian provinces. It occurs in open sandy savanna, roadsides and waste areas. The single Kentucky station from the DBNF occurs in a dry sandstone in a sandstone rockshelter.

Cliff Lover -- *Paxistima canbyi* – This species is an Appalachian provinces species that occurs on thin soils associated with limestone (or other calcareous) cliffs. These sites are usually with a hundred feet or so from the cliff edge, are dry, and tend to have a southerly (SE to NW) aspect.

The sites often have a closed canopy, but the mid-story and shrub layers are thin and open. It rarely is found in old fields. At one site observed on private land, the cutting of the overstory (usually eastern red cedar, *Juniperus virginiana* and oak species, *Quercus* spp.) resulted in a thick coppice of tree and shrub species. Over a two-year period, the *Paxistima* population was nearly eliminated. The species is probably not tolerant of fire.

Mock Orange – *Philadelphus inodorus* var. *grandiflorus* (per Medley, 1993) – is an Appalachian provinces species. It is found along stream banks, on moist soil in open forest, and on cliffs. On the DBNF, the species is found on limestone cliffs and glades.

Wafer Ash or Hop-tree – *Ptelea trifoliata* (as ssp. *trifoliata* var. *trifoliata* per Medley, 1993) – is found in eastern North American. It is found in moist or rich forest. On the DBNF, it is infrequent but locally abundant on limestone outcrops in open dry-mesic forest or along roadsides.

Bay Starvine – *Schisandra glabra* – is a piedmont and Gulf coastal plain species with outlying populations along the Mississippi River, the Atlantic Ocean and the Cumberland Plateau. In the main part of its range, the species is found in beech-magnolia forest. Elsewhere it is found on loess soils. The single population in Kentucky, partially located on the DBNF, is on talus slopes below sandstone cliffs in mesic tulip poplar-hemlock-beech-oak forest. While the plant can be high climbing, it will creep along the ground. Light to moderate shade with well-drained soils and ample moisture is needed.

White-haired Goldenrod – *Solidago albopilosa* – is endemic to the Red River Gorge area of Kentucky. Most of the occurrences are on the DBNF. It is found in damp to xeric sandy soil in sandstone or conglomerate rockhouses or in crevices on sheltered cliff faces. All occurrences are behind the drip line created by the rock overhang. The species is known to require moisture for germination, but will survive as an adult plant in deep, xeric sandy soil. The species will spread in rock shelters vegetatively, and it appears that trampling by humans is the primary barrier to maintaining the species.

Shale-barren Goldenrod – *Solidago harrisii* – narrowly defined is known only from shale barrens of Maryland and the Virginias. A form occurring on limestone glades and open dry-mesic (usually) to dry-xeric (rarely) forest on limestone outcrops is known from Virginia and Kentucky. Much of the Kentucky material is found on or near the DBNF. It is often in light to moderate shade, but does occur in the open. Soils are usually thin.

Snowberry – *Symphoricarpos albus* var. *albus* – is a northern species that has a range extension south into the Appalachian provinces. It is found on dry or rocky soil, often of calcareous nature. It is usually found in open or lightly shaded forest, or sometimes in open areas. The DBNF area records are from Estill and Madison counties, all from narrow limestone ridges in open forest or in thickets.

Roundleaf Fameflower – *Talinum teretifolium* – is a species of the central and southern Appalachians. It is found on thin soil over rock, in much of its range serpentine. On the DBNF, it is known from several stations in McCreary and Pulaski Counties. It occurs on here on sandstone glades and cliff edges either in the open or in the light shade of yellow pines or oaks.

Little Mountain Meadowrue – *Thalictrum mirabile* – is endemic to the Cumberland Plateau of Kentucky, Tennessee and Alabama. It is found on cool, permanently wet sandstone or conglomerate cliffs, usually in light to moderate shade. On the DBNF, this species is usually found in rockhouses between the drip line and back wall. It is often found just behind small waterfalls. It is taxonomically close to, and possibly indistinct from mountain meadowrue (*T. clavatum*).

Nettle-leaf Noseburn – *Tragia urticifolia* – is a prairie species with scattered stations eastward. It is commonly found in dry prairies and open (low tree density) rocky areas. It is known to Kentucky from only one site in the DBNF area. Here it occurs on a limestone glade above the Big South Fork River.

Ferns

Wallrue Spleenwort – *Asplenium ruta-muraria* – is a strong calciphile throughout its range. On the DBNF, it grows on dry, more or less exposed, limestone cliff faces. It occurs in small clumps.

Filmy Fern – *Trichomanes boschianum* – is endemic to the southern Appalachians and a westward extension to the Dripping Springs escarpment of Kentucky, Indiana and Illinois. It is found on ledges and in crevices of damp, humid and shaded sandstone or conglomerate rockhouses. The populations on the DBNF are found in the same habitat.

Appalachian Gametophyte Fern – *Vittaria appalachiana* – is a central and southern Appalachian endemic with outlying populations on the Dripping Springs escarpment of Kentucky and Indiana. It is found on ledges and in crevices of damp, humid and shaded sandstone or conglomerate rockhouses or crevices in cliffs. On the DBNF, the species is found in the same habitat.

Gymnosperms

Ground Juniper – *Juniperus communis* var. *depressa* – is a northern species whose range extends into the southern Appalachians. It occurs on rocky sites, in the open or under open canopy. On the DBNF, the two known sites occur on sandstone cliff tops, rooted in rocky soil in areas of open canopy. Fire may have a detrimental effect on the species.

Pitch pine – *Pinus rigida* – ranges from New England to the Appalachian Mountains. It grows in generally sterile, sandy soil where it competes well against many other woody species. These soils are usually dry, but may be moist. The cones are semi-serotinous, opening following hot fires or occasionally very hot days. Fire also prepares a seedbed advantageous to the light seeds. On the Daniel Boone NF, this species is most commonly found within a few hundred feet of sandstone cliffs. The soils here are sandy, thin and usually dry providing the conditions under which the species competes. These areas also would have been subject to periodic burning, aiding regeneration of the species.

Canada Yew -- *Taxus Canadensis* -- is northeastern species with a range extension southward along the Appalachians. In the northern part of the range, it occurs in mixed mesophytic forest,

hemlock forest, and in other hardwood forest where moderate shade and cool temperatures prevail. It is also known from bogs, swamps, gorges, ravine slopes, and rocky banks. On the DBNF, the species is primarily associated with cool air drainages near caves and in deep, shaded hollows. Here it usually is in mixed mesophytic forest. It also occurs on road cuts and cliffs on lower and mid-slopes within in this forest type.

Northern White Cedar – *Thuja occidentalis* – has a northeastern North American distribution with range extensions southward along the Appalachian provinces and other westerly disjunct stations. In its primary range, the species occurs in moist to damp soil, or swamps where it can form dense monotypic forests. On the DBNF, the species is found on limestone cliffs and talus slopes along the Cumberland River and some of its major tributaries. In most case, the plants are associated with karst seeps on the cliffs. One location is on a sandstone boulder in a creek.

Liverworts

Liverwort – *Jubula pensylvanica* – is found throughout eastern North America. It grows in clean, low flow water where it is attached to sandstone rocks and cobble. These sites are in heavy shade. It grows in similar sites on DBNF as well as on saturated sand in sandstone rockshelters.

Liverwort – *Plagiochila austinii* – is an Appalachian provinces endemic. It found on shaded rock outcrops. On the DBNF, the species is known from a couple of stations, both on shaded and moist sandstone cliff.

Liverwort – *Plagiochila sullivantii* – is a southern Appalachian endemic. It occurs on damp, shaded sandstone and conglomerate cliffs, outcrops, rockshelters and crevices. Humidity is usually high and constant. The habitat for the species on the DBNF is the same.

Liverwort – *Radula sullivantii* – is a southern Appalachian endemic. A single record is known for Kentucky, from Rockcastle County. All other known records for the species are in the Ridge and Valley and Blue Ridge ecological provinces. It occurs on damp, highly shaded sandstone or conglomerate rocks in areas of constantly high humidity. Such areas do exist along the Rockcastle River, but this specimen may represent a misidentification.

Monocots

Wild Agave – *Agave virginica* – occurs in small to large colonies. The plant is a strong calciphile and is usually found on limestone. It is found in crevices in bedrock, in heavy clay or clay loam soils found on limestone. The sites are usually lightly to moderately shaded. In most cases, the species grows where it is well drained. It is often found in glades, at the base of and on cliffs, and in old quarries.

Ofer Hollow Reed Grass – *Calamagrostis porteri* ssp. *insperata* – is an Appalachian and Ozarkian species with one station within the DBNF proclamation boundary. It occurs here on thin, rocky soils over limestone, sandstone, and siltstone near the edge of cliffs, on ridges and on slopes in dry mesic forest. The oak or oak-cedar forest is open and dry. The species does not appear to flower without fire.

Porter's Reed Grass – *Calamagrostis porteri* ssp. *porteri* – is an Appalachian species associated

with calcareous substrates. On the DBNF, the species is found in thin rocky soils over calcareous siltstone in oak forest. The grass is found in areas of open canopy or in bands along road cuts and other corridors. Fire would maintain open conditions for the species and it is known to induce flowering.

Loesel's Twayblade – *Liparis loeselii* – is a northern and mid-western North American species. It is found in wet to damp forest. On the DBNF, it is known from wet seeps on roadsides, a seep at the base of an abandoned limestone quarry, and at the edge of a strip mine pond.

Plains Muhlygrass – *Muhlenbergia cuspidata* – is a prairie species with disjunct populations in Kentucky. It grows in prairies or other open grassland on dry, usually gravelly or rocky soil. On the DBNF, the few locations occur on limestone in open glade areas.

Rough Dropseed – *Sporobolus clandestinus* – is tall grass prairie species, which also occurs on the coastal plain. It is found in dry sandy soil of prairies, openings, barrens, and along roadways and other rights-of-way. On the DBNF, the species is found in McCreary and Pulaski Counties on limestone cliffs and open, sandy yellow pine or yellow pine-oak forest.

Mosses

Moss – *Brothera leana* – is uncommon throughout its range. It is known from a few sites in the DBNF at the mouths of limestone caves. Cool air flow and moist (at least high humidity) conditions are provided at these locations.

Sword Moss – *Bryoxiphium norvegicum* – is a northern species that extends southward through the Appalachian Mountains. It is found on wet to damp sandstone and conglomerate in areas of constant high humidity. On the DBNF it occurs on overhangs and on the ceilings of rockhouses along cliffs where shade is high. It also occurs on boulder overhangs near streams.

Feather or Log Moss – *Hypnum curvifolium* – has a wide distribution in North America. The species is uncommon to common and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Moss – *Mnium hornum* – is found on stream banks and in sandstone or conglomerate rockhouses. On the DBNF, the most common habitat is on sandy stream banks along low gradient sections of streams. These areas are usually under a canopy of hemlock, magnolia and rhododendron. While it may occur with *Tricochlea trichomitria*, it appears more tolerant of deposition.

Cataract Metal Moss – *Scopelophila cataractae* – is found in isolated populations in the Appalachians and a few western states within the US. It is known from thin soil over rock and from a roadcut near a stream. In Kentucky, it is known from one site (Wolfe County) in the Red River Gorge on the DBNF. It was found in a sandstone rockhouse, most likely in a shaded, damp location.

Moss – *Syrrhopodon texanus* – is a coastal plains species with disjunct distribution in the Appalachian and Ozarkian provinces. It commonly occurs on moist rotten logs and stumps, on rock and the bark of trees, especially in low ground. On the DBNF, the species is almost always encountered on the back walls of moist, shaded sandstone or conglomerate rockhouses or cliff faces.

Moss – *Tortula norvegica* – has a western North American distribution with scattered disjunct populations in the east. In its primary range, it is found on calcareous soil and rock and is montaine. A single location for the species in Kentucky is known from near the DBNF (Estill County). It was found on an open, dry limestone ridge lightly shaded by oak-cedar.

References:

- Barbour R.W. 1971. Amphibians and Reptiles of Kentucky. The University Press of Kentucky, Lexington, KY.
- Behler, J.L. and F.W. King. 1979. The Audubon Society Field Guide to North American Reptiles and Ampibians. Alfred A. Knopf, New York.
- Behler, J.L. and F.W. King. 1979. The Audubon Society Field Guide to North American Reptiles and Amphibians. Alfred A. Knopf, New York.
- Conant, R. and J.T. Collins. 1991. Peterson Field Guide to Reptiles and Amphibians: Eastern and Central North America. 3rd ed. Houghton Mifflin, Boston.
- Conant, R. and J.T. Collins. 1991. Peterson Field Guide to Reptiles and Amphibians: Eastern and Central North America. 3rd ed. Houghton Mifflin, Boston.
- Gordan, R.E. 1967. Aneides aeneus. Cat. Amer. Amphib. Rept.: 30.1-30.2.
- Hamel, Paul B. 1992. Land Manager's Guide to Birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Mengel, R.M. 1965. The Birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581 pp.
- Mount, R.H. 1975. The Reptiles and Amphibians of Alabama, Auburn, AL; Auburn Univ. Agric. Exp. Sta. 347 pp.
- NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Association for Biodiversity Information, Arlington, VA. Available: <http://www.natureserve.org/>. (Accessed: July 25, 2001)
- Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky, Lexington, KY. 372 pp.
- Storm Damage DEIS (Source provided by lit searchers; on list?)

07/15/2003

VA Dept of Game and Inland Fisheries: VA Fish and Wildlife Information Service. 2001.
Available: <http://www.dgif.state.va.us/>. (Accessed July 26, 2001).

Wilson, L.A. 1995. Land Manager's Guide to the Amphibians and Reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and The U.S. Forest Service, Southern Region, Atlanta, GA.

07/15/2003

Attachment C.

Rock Outcrops Habitat Association Matrix

Association	Habitats	Modifier	Class	Common/Species
13-Rock Outcrop	Limestone Cave/Rock Houses	(blank)	INSEC	Exotic Cave Beetle/ Pseudanophthalmus exoticus
			MAMM	Eastern Small-footed Bat/ Myotis leibii
				Gray Bat/ Myotis grisescens
				Rafinesque's Big-eared Bat/ Corynorhinus (Plecotus) rafinesquii rafinesquii
				Southeastern myotis/ Myotis austroriparius
				Virginia Big-eared Bat/ Plecotus townsendii virginianus
		Cool Temperatures		Indiana Bat/ Myotis sodalis
		Moderate Shade		Allegheny Woodrat/ Neotoma magister
		Moist	GASTR	Estill Mesodon/ Mesodon estillensis
		Open Forest Canopy	MAMM	Indiana Bat/ Myotis sodalis
	Limestone Cliff/Outcrop	(blank)	BIRD	Peregrine Falcon/ Falco peregrinus
			MAMM	Eastern Small-footed Bat/ Myotis leibii
				Rafinesque's Big-eared Bat/ Corynorhinus (Plecotus) rafinesquii rafinesquii
				Virginia Big-eared Bat/ Plecotus townsendii virginianus
			P-DIC	Mountain Lover/ Paxistima canbyi
			P-FER	Wall rue Spleenwort/ Asplenium ruta-muraria
			P-MON	Plains Muhlygrass/ Muhlenbergia cuspidata
			P-MOS	Tortula/ Tortula norvegica
		Acidic Substrate	GASTR	Queen Crater/ Mesodon chilhowensis
		Aspect (SE to NW)	P-MON	Plains Muhlygrass/ Muhlenbergia cuspidata
		Basic Substrate	GASTR	pupilids/ Pupillidae
			P-GYM	Northern White Cedar/ Thuja occidentalis
		Cold Air Drainage		Canada Yew/ Taxus canadensis
		Dry	GASTR	pupilids/ Pupillidae
			P-FER	Wall rue Spleenwort/ Asplenium ruta-muraria
			P-GYM	Eastern Redcedar/ Juniperus virginiana var. virginiana
			P-MON	Plains Muhlygrass/ Muhlenbergia cuspidata
		Leaf Litter	GASTR	Banded Globe/ Anguispira kochi
		Moderate Shade	MAMM	Allegheny Woodrat/ Neotoma magister
			P-DIC	Harris's Goldenrod/ Solidago harrissii
				Mountain Lover/ Paxistima canbyi
				Wafer Ash, Hop-tree/ Ptelea trifoliata
		Moist	GASTR	Estill Mesodon/ Mesodon estillensis
			P-MON	Wild Agave/ Agave virginica
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Old Growth Condition	GASTR	Banded Globe/ Anguispira kochi
		Open (Little or No Shade)		pupilids/ Pupillidae
			P-DIC	Harris's Goldenrod/ Solidago harrissii
				Mountain Lover/ Paxistima canbyi
		Open Forest Canopy		Mountain Lover/ Paxistima canbyi
				Snowberry/ Symphoricarpos albus var. albus
		Remote Habitat	BIRD	Peregrine Falcon/ Falco peregrinus
		Rocky/Rocks	MAMM	Eastern Spotted Skunk/ Spilogale putorius
			P-GYM	Northern White Cedar/ Thuja occidentalis
		Seep/Constant Water	P-MON	Loesel's Twayblade/ Liparis loeselii
		Slope (hillside, steepness)	GASTR	Banded Globe/ Anguispira kochi
	Limestone Glade	(blank)	P-DIC	Mountain Lover/ Paxistima canbyi
			P-GYM	Eastern Redcedar/ Juniperus virginiana var. virginiana
			P-MOS	Tortula/ Tortula norvegica
		Dry	GASTR	pupilids/ Pupillidae
			P-GYM	Eastern Redcedar/ Juniperus virginiana var. virginiana
			P-MON	Wild Agave/ Agave virginica
		Moderate Shade	P-DIC	Harris's Goldenrod/ Solidago harrissii
				Mock Orange/ Philadelphus inodorus
		Moist	P-MON	Wild Agave/ Agave virginica
		Open (Little or No Shade)	GASTR	pupilids/ Pupillidae

07/15/2003

Association	Habitats	Modifier	Class	Common/Species
			P-DIC	Harris's Goldenrod/ Solidago harrissii
				Nettle-leaf Noseburn/ Tragia urticifolia
	Mudstone/ Siltstone/Shale Cliff/Outcrops	(blank)	AMPHI	Wehrle's Salamander/ Plethodon wehrlei
			BIRD	Peregrine Falcon/ Falco peregrinus
		Cold Air Drainage	P-GYM	Canada Yew/ Taxus canadensis
		Downed Logs	REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Dry	P-GYM	Eastern Redcedar/ Juniperus virginiana var. virginiana
			P-MON	Ofer Hollow Reed Grass/ Calamagrostis porteri ssp. insperata
				Porter's Reed Grass/ Calamagrostis porteri ssp. porteri
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Open (Little or No Shade)	P-DIC	Harris's Goldenrod/ Solidago harrissii
			P-MON	Ofer Hollow Reed Grass/ Calamagrostis porteri ssp. insperata
				Porter's Reed Grass/ Calamagrostis porteri ssp. porteri
		Open Forest Canopy	P-DIC	Harris's Goldenrod/ Solidago harrissii
		Remote Habitat	BIRD	Peregrine Falcon/ Falco peregrinus
		Rocky/Rocks	P-MON	Ofer Hollow Reed Grass/ Calamagrostis porteri ssp. insperata
				Porter's Reed Grass/ Calamagrostis porteri ssp. porteri
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
				Timber Rattlesnake/ Crotalus horridus
	Sandstone Cave/ Rock Houses	(blank)	AMPHI	Green Salamander/ Aneides aeneus
			MAMM	Rafinesque's Big-eared Bat/ Corynorhinus (Plecotus) rafinesquii rafinesquii
				Virgina Big-eared Bat/ Plecotus townsendii virginianus
			P-DIC	White-haired Goldenrod/ Soldiago albopilosa
		Acidic Substrate		French's Shooting Star/ Dodecatheon frenchii
		Cool Temperatures		Cumberland Sandwort/ Arenaria cumberlandensis
		High Shade	INSEC	Cliff Caddisfly/ Manophylax butleri
			P-DIC	Cumberland Sandwort/ Arenaria cumberlandensis
			P-FER	Appalachian Gametophyte Fern/ Vittaria appalachiana
				Filmy Fern/ Trichomanes boschianum
			P-MOS	Sword Moss/ Bryoxiphium norvegicum
		High/Constant Humidity (Microclimate)	INSEC	Cliff Caddisfly/ Manophylax butleri
			P-DIC	Cumberland Sandwort/ Arenaria cumberlandensis
				Little Mountain Meadow Rue/ Thalictrum mirabile
			P-FER	Appalachian Gametophyte Fern/ Vittaria appalachiana
				Filmy Fern/ Trichomanes boschianum
		Moderate Shade	MAMM	Allegheny Woodrat/ Neotoma magister
			P-DIC	Lucy Braun's White Snakeroot/ Eupatorium luciae-brauniae
			P-MOS	Moss/ Syrrhopodon texanus
		Moist	INSEC	Cliff Caddisfly/ Manophylax butleri
			P-DIC	Cumberland Sandwort/ Arenaria cumberlandensis
				Lucy Braun's White Snakeroot/ Eupatorium luciae-brauniae
			P-FER	Appalachian Gametophyte Fern/ Vittaria appalachiana
				Filmy Fern/ Trichomanes boschianum
			P-MOS	Moss/ Syrrhopodon texanus
				Streamside Mnium/ Mnium hornum
				Sword Moss/ Bryoxiphium norvegicum
		Rocky/Rocks		Cataract Metal Moss/ Scopelophila cataractae
		Sandy Soil	P-DIC	Cumberland Sandwort/ Arenaria cumberlandensis
				Lucy Braun's White Snakeroot/ Eupatorium luciae-brauniae
		Seep/Constant Water	P-LIV	Liverwort/ Jubula pensylvanica
		Water (Distance Sensitive)	INSEC	Cliff Caddisfly/ Manophylax butleri
	Sandstone Cliff/Outcrop	(blank)	AMPHI	Green Salamander/ Aneides aeneus
			BIRD	Peregrine Falcon/ Falco peregrinus
			INSEC	Cliff Caddisfly/ Manophylax butleri
			MAMM	Rafinesque's Big-eared Bat/ Corynorhinus (Plecotus) rafinesquii rafinesquii
				Virgina Big-eared Bat/ Plecotus townsendii virginianus
			P-DIC	Little Mountain Meadow Rue/ Thalictrum mirabile
				Roundleaf Fameflower/ Talinum teretifolium
			P-GYM	Ground Juniper/ Juniperus communis var. depressa
		Acidic Substrate	GASTR	Queen Crater/ Mesodon chilhowensis

07/15/2003

Association	Habitats	Modifier	Class	Common/Species
		Aspect (SE to NW)	P-GYM	Ground Juniper/ Juniperus communis var. depressa
		Cool Temperatures	INSEC	Cliff Caddisfly/ Manophylax butleri
		Dry	P-DIC	Florida Pellitory/ Parietaria floridana
				Roundleaf Fameflower/ Talinum teretifolium
			P-GYM	Pitch Pine/ Pinus rigida
		High Shade	INSEC	Cliff Caddisfly/ Manophylax butleri
			P-LIV	Austin's Leafy Liverwort/ Plagiochila austinii
				Sullivant's Leafy Liverwort/ Plagiochila sullivantii
			P-MOS	A liverwort/ Radula sullivantii
				Feather Moss, Log Moss/ Hypnum curvifolium
		High/Constant Humidity (Microclimate)	P-LIV	Sullivant's Leafy Liverwort/ Plagiochila sullivantii
			P-MOS	A liverwort/ Radula sullivantii
		Moderate Shade	MAMM	Allegheny Woodrat/ Neotoma magister
		Moist	AMPHI	Green Salamander/ Aneides aeneus
			GASTR	Clifty Covert/ Mesodon wetherbyi
			INSEC	Cliff Caddisfly/ Manophylax butleri
			P-MOS	Feather Moss, Log Moss/ Hypnum curvifolium
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
		Open (Little or No Shade)	P-DIC	Box Huckleberry/ Gaylussacia brachycera
				Riverbar Goldenrod/ Solidago spathulata
				Roundleaf Fameflower/ Talinum teretifolium
		Remote Habitat	BIRD	Peregrine Falcon/ Falco peregrinus
		Riparian	P-MOS	A liverwort/ Radula sullivantii
		Rocky/Rocks	BIRD	Common Raven/ Corvus corax
			MAMM	Eastern Spotted Skunk/ Spilogale putorius
			P-DIC	Appalachian Sandwort/ Minuartia glabra
			REPT	Timber Rattlesnake/ Crotalus horridus
		Sandy Soil	P-GYM	Pitch Pine/ Pinus rigida
		Seep/Constant Water	P-FER	Southern Bog Club-moss/ Lycopodiella appressa
		Slope (hillside, steepness)	GASTR	Clifty Covert/ Mesodon wetherbyi
		Water (Distance Sensitive)	INSEC	Cliff Caddisfly/ Manophylax butleri
	Sandstone Glade	Ericaceous Shrub Associate	P-DIC	Cow Wheat/ Melampyrum lineare
		Open Forest Canopy		Box Huckleberry/ Gaylussacia brachycera
	Talus Slopes	(blank)	REPT	Timber Rattlesnake/ Crotalus horridus
		Acidic Substrate	GASTR	Queen Crater/ Mesodon chilhoweensis
		Dry	P-GYM	Eastern Redcedar/ Juniperus virginiana var. virginiana
		Moderate Shade	P-DIC	Bay Starvine/ Schisandra glabra
				Black Cohosh/ Cimicifuga americana
		Open (Little or No Shade)	REPT	Eastern Earth Snake/ Virginia valeriae valeriae
		Rich Soil	P-DIC	Black Cohosh/ Cimicifuga americana
		Rocky/Rocks	MAMM	Eastern Small-footed Bat/ Myotis leibii

Viability Assessment Report For Seeps/Swamp Habitat Association

Prepared by
David D. Taylor
Daniel Boone National Forest

I. Description of Habitat Association

Three distinct habitats are included in this association. All are wetland habitats and generally all are forested. The three habitats are related by the function of ground and surface water within the habitats. Each of the three habitats will be addressed individually.

A. Streamhead seeps and wetlands

Streamhead seeps and wetlands are found across the cliff section of the Daniel Boone National Forest (DBNF). They are rare on the Redbird unit. They are most common in the Central Cliffs (221Hb) and Southwestern Cliffs (221Hc) ecological subsections of the Forest, but may occur in the Rugged Eastern Hills (221Ha), Low Hills (221He), and Kinniconick and Licking Knobs (222En) subsections (USDA Forest Service, 1997; 1996). These seeps and wetlands are usually located below the ridge on upper to mid-slopes. On steep ground, the wetlands tend to be close to the ridge or base of a cliff. These wetlands tend to form in 1st order streams immediately below, and generally have no more than 5-11 sq ft (.5-1 sq m) area. On flatter ground, they tend to be further down the slope. Distances at a few sites on the south end of the Forest average 980 ft (300 m) along the slope from the top of the ridge to the seep. Here, they form in near level sections of 2nd and 3rd (rarely 4th) order streams. These seeps are larger, ranging on the Forest from 100-20,000 sq ft (9-1860 sq m). They may be linear to broadly bowl shaped. Streamhead seeps, while occurring in conjunction with streams, are restricted to areas where geologic contact zones allow ground water to emerge at the surface. On the DBNF, these contact zones are at sandstone over shale/siltstone/(rarely) coal, and limestone over shale/siltstone. Soils are usually sandy, and may have a clay lens below the surface acting as bowl to catch and hold water. At least on the 2nd and 3rd order stream sites, the sandiness may be related to the levelness of these habitats. The sites are nearly pure sand, with sand depths ranging from an inch or so to better than 6 feet. It is possible that a past change in water flow allowed sand to deposit and hence create a near level site, or sand may simply settle on sites already near level. These wetlands are characterized by perennial water flow primarily of ground water origin. Even during drought conditions, these wetlands have flowing water, although the water flow may be below the streambed surface. From observation on the Forest, it is known that changes in surface hydrology increasing the flow of water into the system have a generally negative effect on the wetlands. The increased flow can result in the drying of the wetland by dropping the water table. A combination of head cutting and down cutting in the stream drains the saturated sand pockets leaving them literally high and dry. Increased sediment deposition

on these sites can also have a drying effect by raising the surface of the sand above the maximum water table. Sedimentation under other conditions probably contributes to formation of at least some of the 2nd and 3rd order stream associated wetlands by filling in low areas with sand, which then becomes saturated with water.

The primary energy source in these systems is photosynthesis. Other energy sources in these wetlands include surface and groundwater flow. These flows bring organic compounds to the otherwise near sterile soils found in the systems. Leaf litter drop from vegetation in and around the seeps also contributes energy sources.

Vegetation in streamhead wetlands and seeps is characterized by wetland species. Which species occur in the wetlands depends on the particular system in question. Cliff base seeps have the simplest vegetation. At the base of sandstone/conglomerate cliffs, almost always cinnamon fern or interrupted fern are present. Sometimes royal fern maybe found. Other species that may occur are mountain pepperbush, bulrush, and a few caric sedge species. There is usually an open canopy of mixed oak-mesic hardwoods, which may include yellow pines. Occasionally, the seeps occur in rhododendron or mountain laurel thickets, and here, the seeps are generally devoid of vegetation. At the base of limestone cliffs, the seeps are often free of vegetation, but may have present jack-in-the-pulpit, pawpaw, and a few caric sedge species. The larger streamhead seeps found on 2nd to 4th order streams have a much more varied vegetation. Cinnamon fern is almost always present, and royal fern is also common. In somewhat drier areas, New York fern is common to dominant. White-topped aster, ironweed, tear-thumb, climbing fern, bulrushes, caric sedge species, swamp goldenrod, spreading panic grass and several species of sphagnum moss are frequently encountered. Sphagnum mosses often form a carpet over most of the seep through which other species grow. Rare species found in these seeps include white-fringeless orchid, crested orchid, New York ironweed, spreading pogonia, Nuttall's lobelia, fox grape, and appressed bog clubmoss. Woody species in the seeps include red maple, sweet gum, alder, white pepperbush, mountain laurel, mountain holly, American holly, and occasionally white oak, eastern hemlock and tulip poplar. The surrounding forest may be upland pine-oak or oak to more mixed mesic hardwood.

B. Swamp (wooded wetland)

Swamps as defined here are distinct from streamhead wetlands and seeps, and other seeps, in that they are characterized by standing water, in which trees are growing. Streamhead seeps and wetlands may have woody vegetation in them, but in these, the water is flowing and often not standing on the surface. Swamps differ from bogs in that bogs are open and not characterized by woody vegetation, but may have somewhat stagnant water.

Swamps are found across the DBNF, but are nowhere common. They may occur in any landtype association (LTA) on the Forest. Swamps generally occur on lower landscape positions, often associated with a river, large stream or occasionally a reservoir. They can occur in perched positions as well, above larger watercourses. Where they occur, the site is relatively level to concave allowing the pooling of water. The underlying geology can

be shale, limestone or sandstone rock. Soils are important as they determine whether a given site will collect water. A clay layer is necessary at the bottom of the site to enable collection of water. Upper layers of soil in swamps may be sandy, loamy or most commonly clayey. Swamps are characterized by water that is permanent or nearly so. Water sources are usually surface water, but can be ground water as well. Water depth may range from a few inches to several feet and the water is generally stagnant.

Photosynthesis is the primary energy source for swamps. Incoming water provides some energy to the system bringing with it organic material. Leaf fall from vegetation in and around the swamp also provides energy input.

Swamps are characterized by woody vegetation. Woody species that are likely to be present in swamps on the DBNF include black willow, river birch, sycamore, red maple, sweet gum, alder, American holly, and occasionally mountain laurel and shrub dogwood. White oak, tulip poplar and eastern hemlock are occasionally found on hummocks within the swamp. Other species include caric sedge species, bulrush species, wild ramie, swamp sticktight, and smartweeds. The herbaceous layer is frequently sparse, especially in swamps with more closed canopies.

C. Seeps/Bogs-including slopes, not streamheads

These wetlands are uncommon on the DBNF. A cluster of small (10-20 sq ft, 1-2 sq m) to large (1 ac, 0.4 ha) of mostly slope seeps (some streamhead seeps are present) occurs at the north end of the Forest in the Knob Plateau (222En001) LTA (USDA Forest Service, 1997; 1996). Elsewhere on the forest, these wetlands are uncommon, but occur on every district. They occur on gentle to moderate slopes below the ridge, usually between upper and mid-slope. The underlying geology includes a contact zone at which groundwater may emerge at the surface. Contacts include sandstone over shale/siltstone/(coal), limestone over shale/siltstone and sand/gravel over shale/siltstone. Soils in these wetlands are generally sandy, but may be clayey. Slope seeps are characterized by perennial sheet-like water flow, mostly from ground water sources. Even in drought, water moves through the seeps below the surface. Large or sudden increases in surface water flow may disrupt hydrology of the seeps by cutting channels concentrating water in some places and thereby dropping the water table in other places.

Photosynthesis is the primary energy source of these systems. Both ground and surface water contribute to the energy sources of these systems by move organic matter into the wetland. Other organic matter is introduced through leaf fall from vegetation in and around the wetland.

Vegetation in slope wetlands is varied. On many sites, there is a forest canopy composed primarily of oak and species such as sycamore and river birch. Yellow pine is present in some on hummocks. Alder, American holly, chokeberry, mountain holly, and mountain laurel may be in the understory. Herbaceous species include caric sedges (often dominant), cinnamon and royal ferns, and bulrushes. In some, sphagnum mosses form thick mats on the surface through which other vegetation grows. Some of the slope seeps are not forested; most of these occur in utility rights-of-way. Vegetation here is largely

grass consisting of big bluestem, little bluestem, Indiangrass, panic grasses, and purpletop. Numerous forbs may also present including gayfeathers, swamp goldenrod, Appalachian spreading pogonia, sunflowers, spikemoss, and whitetop aster. Occasionally shrubs, including mountain laurel, lowbush blueberry and interior willow, are present.

II. Current Status of Habitat Association on the Daniel Boone National Forest

To date, there has been no systematic survey for wetland, seep and swamp habitats on the DBNF. However, cooperative rare species inventories conducted between 1987 and 1993 (United States Forest Service et al., 1988-1994) identified numerous seeps and wetlands, and project species surveys have identified others. Some additional information is available from USDI wetland surveys, but no ground truthing has occurred. Data on known locations is not yet organized in spatial or tabular databases. At least 100 sites are known which fit one of these habitat types. Most are clustered in one area near Morehead, KY.

It is believed that there are fewer sites on the Cumberland Plateau attributable to one of these habitat types now than there were 200 years ago. This is especially true for the streamhead seep type. Currently on land adjacent to or not far from National Forest, streamhead seeps have been cleared in the last 5 years. Large acreage of pastureland with appropriate geology, landform and stream types exists today without the expected streamhead vegetation and form. These sites are largely planted in fescue. Two hundred years ago, many more of these sites would have been in wooded condition with functional wetlands. Many acres around the London, KY area with suitable conditions for streamhead seeps are being converted to subdivisions or other development land. Between 1900 and 1930, most of the land now comprising the DBNF was cut over and burned. This undoubtedly had an effect on these habitats. Equipment likely crossed through many wetlands or seeps (some today still have evidence of past roads), and the cutting of trees changed the hydrology of sites, probably eliminating some, but possibly creating others.

A few important seep and swamp wetlands still exist on private land in the vicinity of the DBNF. However, the bulk of the sites on the Cumberland Plateau are believed to be on the DBNF. The continued local (in some cases, state wide) existence of many of the species found in these habitats is probably dependent on maintaining the sites on National Forest land.

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The management goal for the seeps habitat association is to maintain the physical and microclimate conditions that will result in a high likelihood that species within this association will persist on the forest over the planning period. (FLRMP, IV:79, in part)

The strategy to accomplish this goal focuses on maintaining zones of limited disturbance around the habitat association. Additional standards and guidelines are also recommended when other management measures are needed to insure the viability of a particular species associated with this habitat association.

The desired future condition of this habitat association is an area of limited disturbance around these systems in which hydrologic systems function with limited or no modification as a result of management actions

1. Habitat Association General Direction and Standards and Guidelines (S&G)

A. Management activities are restricted within the seep or swamp watershed

- Seeps, streamheads and swamps forest-wide will be managed to retain the watershed above and adjacent to the site in forest canopy at a minimum of 60 BA or the existing BA if lower. The midstory layer BA may be reduced or removed.

Rationale: Microclimate conditions (temperatures, humidity, moisture) are important in maintaining viable populations of many species occurring in this habitat association. In addition, removal of overstory affects hydrology of the site, usually increasing runoff. A reduced or removed midstory layer allows more side light to reach the wetlands, increasing light for the target species, but reducing overhead light favored by competing woody species.

- Watershed areas below seeps, streamheads and swamps will be maintained in forest canopy at a minimum of 60 BA, or the existing BA if lower, where changes in water flow have high likelihood of inducing down cutting or head cutting in the associated stream.
 - Rationale: Generally once on extensive bedrock, or below a cataract, head cutting and down cutting concerns are minimized or eliminated. Until bedrock is reached, increased water in the stream below a wetland site can cause negative changes to the hydrology of the habitat above.
- On a site-specific basis, activities, including vegetative management, can be permitted when the objective is to improve habitat conditions for PETS species.

Rationale: Management activities are sometimes necessary to maintain or enhance individual species habitats.

- Roads and skid trails are not permitted in the watershed above and adjacent to the sites. Limited end-lining is permitted on a site-specific basis, but ruts must be rehabilitated to disperse, rather than concentrate, surface water.
 - Rationale: Roads and skid trails tend to concentrate surface water within the watershed and may introduce surface water from another watershed into the site. Increased or concentrated water flow in these systems is known to increase down cutting and head cutting in the streams, which in turn lowers the water table, drying out the wetlands.
- Activities such as rights-of-way, trails, and scenic vistas may be permitted in the seep/streamhead/swamp watersheds as long as they do not negatively impact, primarily through changes in hydrology, PETS species or their potential habitat.

Hydrologic changes include those due to changes in canopy vegetation. (FLRMP, IV-41,129; in part)

- Rationale: Limited use of the watershed area may not affect species viability on a site-specific basis.
- Firelines for prescribed fire may be constructed in watersheds containing seeps, wetlands and swamps. However, where streamhead and slope seeps are present, these will be hand lines only and should be considered primarily for protecting private property, or protecting or enhancing species at risk or habitat for these species. Constructed lines must not concentrate runoff at points along the seep, but rather spread it out along the length of the seep. Soil exposed during line construction will be seeded and mulched, as needed to prevent erosion, within one week of burning.
 - Rationale: Constructed lines tend to interrupt surface hydrology and may cause damage to the sites. Hand lines are less disruptive to sensitive sites. Even these need to be designed to minimize risk of damage and need rehabilitation after the burn.
- Firelines built during wildfire events WILL NOT be built through streamhead seeps occupied by white fringeless orchid, or identified slope seeps. In addition, firelines will exclude the seeps from fire when going around the site. Elsewhere, firelines and other soil exposed in suppression efforts, in watersheds containing seeps, swamps or wetlands will be treated with, but not limited to, waterbars, seeding (native or noninvasive exotic species only-see Region 8 weed list), and mulching as needed to stabilize exposed soil and prevent concentration of runoff in a few areas. This will occur within one week of line construction or soil disturbance.
 - Rationale: Observations on the Forest indicate most sites occupied by white fringeless orchid and slope seeps would not be expected to recover from fireline construction disturbance. Outside of these areas, firelines might be built in suppression efforts. Restoration of the disturbed ground then becomes priority to prevent damage to the seeps, wetlands or swamps.
- Protective measures such as informational signing, posting sites closed and/or barrier construction may be applied to sites that are receiving resource damage through inadvertent human activity or concentrated wildlife use
 - Rationale: Human and wildlife use of site-specific areas may need to be modified or restricted. Several sites receive intensive deer browsing when one S species is in flower, severely limiting reproductive potential.
- Management activities concentrating public use in the vicinity of sensitive seep/streamhead/swamp areas would be avoided if detrimental impacts were likely to occur.

- Rationale: Site-specific activities need to be evaluated to determine the level of potential inadvertent human impacts to species associated with this habitat association.

(S&Gs developed based on direction in SHNS amendment for other naturally occurring, rare habitats or features providing specialized habitat, and on personal observations; by Taylor, 2001)

B. Protect or enhance habitat for PETS species in seep, streamhead or swamp habitat

- *Prescribed fire of low intensity is permitted year around in the watersheds, and late fall through spring through the seeps/streamheads/swamps themselves, providing that the sphagnum moss or duff layer in the wetland is wet enough to prevent more than ten percent of these materials from burning. Flashy fuels such as graminoids and herbs in the wetlands should be allowed to burn, but are not to be directly fired without site-specific objectives addressing the need. (FLRMP, Amend. 7, in part)*
 - Rationale: At least some, if not all of these sites, evolved with fire. Experimental and accidental burns in other states show that fire can be beneficial to the species living in the wetlands. Open midstory provides increased light supporting pollinator attractors and flowering of white-fringeless orchid, without directly favoring woody species with increases in overhead light.
- Single tree cutting is permitted to provide pockets of open conditions in and immediately adjacent to wetlands and seeps. Trees cut generally should be midstory trees. The overstory canopy on a site will generally be left intact. Trees are to be cut leaving a 3-4 feet high stump.
 - Rationale: Some species, such as white-fringeless orchid, require areas of open to promote flowering or make flowers more available to pollinators. Experimental cutting in one site has shown that midstory trees cut at four feet high do not readily sprout from the base, and only poorly sprout from the stem, preserving the open conditions for a greater period of time.
- Herbicides may be applied within watersheds containing seeps, wetlands and swamps. At least 30 feet must be left around these features and the area treated when applying herbicides from the ground. Where a seep, wetland or swamp contains a PETS species, the minimum distance increases to 60 ft. (FLRMP, Veg EIS, in part)
 - Rationale: The application of herbicide may have valid management use in these watersheds. The stated distances with proper application of materials is expected to protect water and PETS resources.

- Maintain and perpetuate all streamhead and slope seeps, and swamps as they provide habitat for species at risk.
 - Rationale: A complete survey for seep/streamhead/swamp wetlands is not completed. Many of these sites may actually harbor PETS organisms, but necessary inventory is not completed. Natural or culturally induced events may damage existing habitat, and replacement habitat may be needed. At present, creation of such habitat is not feasible.
- Restore or reestablish streamhead and slope seeps, and swamps where impacts have not fully destroyed the character and function of the community.
 - Rationale: It may be easier to reconstruct a damaged community, than try create a new one from scratch.
- Acquire private lands from willing sellers with known wetland sites providing habitat for PETS species.
 - Rationale: Wetland sites are limited in number within the DBNF proclamation boundary, and those with existing PETS populations are more limited. Creation of this habitat is not currently feasible and protection of the habitat is more likely on federal land than on private land.
- Acquire private lands from willing sellers located within watersheds containing seeps/streamheads/swamps occupied by PETS species.
 - Rationale: Protection of known wetlands requires management of the watershed associated with the site, at least above and adjacent to the site, and possibly some distance below the site. See rationale above pertaining to roads and canopy disturbance.

(S&Gs added based on general PETS management goals per ESA and FS policy. PETS species, specifically white fringeless orchid, occupy these sites and are known to be affected by changes in hydrology within these sites. Measures were added to this S&G as best science available measure to insure species viability; Taylor 2001)

IV. Management Needs: Monitoring and Inventory

- Maintain an inventory of grassland areas with spatial and tabular attributes including but not limited to, location, size, type of wetland, condition, and the presence of any species at risk. (High priority)
 - *Rationale: An inventory of wetlands and seeps provides information on which to base management decisions, track yearly and plan period maintenance accomplishments, and estimate habitat suitable for various species at risk.*
- Monitor MAR and other reporting systems to help determine accomplishments for each year and the planning period. (Moderate priority)

- Rationale: MAR and other reporting systems will be filled out yearly. Use data as reported to help verify inventory.
- Monitoring populations of white-fringeless orchid. (High priority)
 - Rationale: 5-6 years of data on population trends are already available for this species. This species is a Candidate for listing, and is sensitive to habitat changes.
- Monitor wetland and seep areas for invasive exotic species, primarily plants, which may compromise habitat conditions. (high priority)
 - *Rationale: Invasive exotics can spread quickly, taking over and rendering unusable or marginal wetland or seep habitat, as well as choking out plants at risk.*

References:

- USDA Forest Service. 1996. Landtype Association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1997. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest, Winchester, KY.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1988. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Somerset Ranger District. Winchester, KY. 245 pp.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1989. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stanton Ranger District. Winchester, KY. 316 pp.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1990. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stearns Ranger District. Winchester, KY. 170 pp.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1991. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Berea District. Winchester, KY. 125 pp.
- USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1992. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Morehead Ranger District. Winchester, KY. 184 pp.

07/15/2003

USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1993. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Redbird Ranger District. Winchester, KY. 184 pp.

USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1994. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, London Ranger District. Winchester, KY. 252 pp.

Attachment A.

Species List: Seeps Habitat Association

Class	Common Name/ Species
ANIMALS	
Amphibians	Jefferson Salamander/ <i>Ambystoma jeffersonianum</i> Marbled Salamander/ <i>Ambystoma opacum</i> Mountain Dusky Salamander/ <i>Desmognathus ochrophaeus</i> Black Mountain Salamander/ <i>Desmognathus welteri</i> Green Frog/ <i>Rana clamitans</i> Wood Frog/ <i>Rana sylvestris</i>
Birds	Wood Duck/ <i>Aix sponsa</i> Northern Harrier – <i>Circus cyaneus</i> Sedge Wren – <i>Cistothorus platensis</i> Least bittern/ <i>Ixobrychus exilis</i> Swainson's Warbler – <i>Limnothylyps swainsonii</i> Hooded Merganser/ <i>Lophodytes cucullatus</i> Pied-billed Grebe/ <i>Podilymbus podiceps</i> Prothonotary warbler/ <i>Protonotaria citrea</i> American Woodcock – <i>Scolopax minor</i> Louisiana Waterthrush – <i>Seiurus motacilla</i>
Mammals	Masked Shrew/ <i>Sorex cinereus cinereus</i>
Reptiles	Timber Rattlesnake/ <i>Crotalus horridus</i> Northern Coal Skink/ <i>Eumeces antracinus anthracinus</i> Southeastern Crowned Snake/ <i>Tantilla coronata</i> Eastern Ribbon Snake/ <i>Thamnophis sauritus sauritus</i>
Snails	Delicate vertigo/ <i>Vertigo bollesiana</i>
PLANTS	
Dicots	Yellow Screwstem/ <i>Bartonia virginica</i> Brook Saxifrage/ <i>Boykinia acontifolia</i> Shaggy Hedge-hyssop/ <i>Gratiola pilosa</i> American Water-pennywort/ <i>Hydrocotyle americana</i> Kidney-leaf Grass-of-Parnassus/ <i>Parnassia asarifolia</i> Cross-leaf Milkwort/ <i>Polygala cruciata</i> var. <i>cruciata</i> Slender Marsh-pink/ <i>Sabatia campanulata</i> New York Ironweed/ <i>Vernonia noveboracensis</i>
Ferns	Engelmann's Quillwort/ <i>Isoetes englemannii</i>

Class	Common Name/ Species
Liverworts	A Liverwort/ <i>Telerania nematodes</i>
Monocots	Cane/ <i>Arundinaria gigantea</i> Atlantic Caric Sedge/ <i>Carex atlantica</i> Cypress-swamp Caric Sedge/ <i>Carex joorii</i> Caric Sedge/ <i>Carex seorsa</i> Uptight Caric Sedge/ <i>Carex stricta</i> Grass-pink/ <i>Calopogon tuberosus</i> Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i> Pink Lady's-slipper – <i>Cypripedium acaule</i> Small Yellow Lady's-slipper – <i>Cypripedium parviflorum</i> var. <i>parviflorum</i> Loesel's Twayblade/ <i>Liparis loeselii</i> Rose Pogonia/ <i>Pogonia ophioglossoides</i> Goldenclub/ <i>Orontium aquaticum</i> Clubspur Orchid/ <i>Platanthera clavellata</i> Yellow-crested Orchid/ <i>Platanthera cristata</i> White Fringeless Orchid/ <i>Platanthera integrilabia</i> Small Purple-fringed Orchid/ <i>Platanthera psycodes</i> Rose Pogonia/ <i>Pogonia ophioglossoides</i> Yellow-eyed Grass/ <i>Xyris caroliniana</i> Yellow-eyed Grass/ <i>Xyris difformis</i> Yellow-eyed Grass/ <i>Xyris torta</i>
Mosses	Sphagnum Moss/ <i>Sphagnum bartlettianum</i> Sphagnum Moss/ <i>Sphagnum magellanicum</i> Large-leaved Sphagnum Moss/ <i>Sphagnum macrophyllum</i> Swamp Sphagnum Moss/ <i>Sphagnum palustre</i>

Attachment B.

Seeps/Swamps Species/Habitat Relationships with References

ANIMALS

Amphibians

Jefferson Salamander -- *Ambystoma jeffersonianum* -- Jefferson salamander is found primarily in shady deciduous forests or mixed woods, low woods and bottomlands. This salamander requires abundant leaf litter, rocks, decomposing logs and stumps. During breeding season, the Jefferson salamander requires temporary ponds, ideally with a pH between 5 and 6 (DeGraff and Rudis, 1986). This salamander is an opportunistic feeder consuming small invertebrates. (Wilson, 1995).

Marbled Salamander -- *Ambystoma opacum* -- The marbled salamander occupies a variety of habitats, ranging from pine forests to mixed pine-hardwoods and apparently does best in areas where abundant leaf litter and fallen logs provide shelter. This salamander will spend much of its' time in burrows, leaf litter or under bark and logs. During late fall, the marbled salamander moves into bottomland hardwoods and deposits its eggs terrestrially. This salamander requires areas subject to fluctuating water levels for breeding and larvae development. The marbled salamander will eat a variety of food items such as insects, other small arthropods, earthworms, snails, and slugs. (Wilson, 1995).

Mountain Dusky Salamander -- *Desmognathus ochrophaeus* -- The mountain dusky salamander has the broadest altitudinal distribution of any desmognathine salamander, reaching the highest elevations in the eastern United States. These salamanders become more terrestrial at higher elevations, apparently in response to increased humidity. (Hairston, 1949; Tilley, 1973c). At high elevations, the mountain dusky salamander prefers cool, moist floors of conifer forests (USGS, 2001); at low elevations, this species occurs primarily under rocks, logs or leaves near stream margins, springs, or seepage areas, where the ground is water saturated. Adults will often move far into the adjacent woodlands, particularly during rains. The mountain dusky salamander requires mesic woodlands, usually hardwoods or mixed pine-hardwood, with springs, seeps or rocky streams. In winter, this salamander is known to congregate in springs or seepage areas. (USGS, 2001). Wet, mossy, rock faces are preferred by this species. The mountain dusky salamander's diet includes small arthropods and earthworms. (Wilson, 1995)

Black Mountain Salamander -- *Desmognathus walteri* -- The type locality for the Black Mountain Salamander is Black Mountain, Harlan County, Kentucky. The range extends through the southeastern two thirds of Kentucky and adjacent Virginia and Tennessee. The Black Mountain Salamander is found in and around mountain streams with moderate to weak current. Occasionally it is found associated with wet, rocky seeps. The black mountain salamander is primarily a nocturnal feeder, which preys on worms, arthropods and crustaceans. The black mountain salamander requires silt-free streams with rocky bottoms. They spend most of the daylight hours concealed under rocks. (Wilson, 1995)

Green Frog – *Rana clamitans* – This frog is a semi-aquatic species occupying many of the same habitats as the large bullfrog, e.g. permanent bodies of water. The green frog can be observed in shallow water, such as springs, seeps, ponds, reservoirs, creeks, beaver ponds, ditches, bogs, floodplain pools, and swamps. The green frog requires semi-permanent water and is an opportunistic feeder. The green frog's diet includes arthropods, snails and worms (Martof et al., 1980). The green frog prefers ponds, floodplain swamps or marshy habitat with grassy edges and emergent vegetation. (Wilson, 1995)

Wood Frog -- *Rana sylvatica* -- The wood frog lives in or near moist woods, hardwood valleys and occasionally white pine-hemlock, and upland pine forest types. The wood frog breeds in open-water ponds, slow-moving portions of streams and roadside ditches. The wood frog's diet consists mainly of insects. Adults require upland forest areas with logs, stumps and rocks for overwintering and moist woods with standing water during the late winter months. (Wilson, 1995)

Birds

Wood Duck – *Aix sponsa* – These birds live around a variety of aquatic habitats that have cavities available for nesting. Swamps, wooded streams, lakes, ponds, reservoirs, and marshes provide suitable habitat. Nesting is in live or dead trees, within cavities, hollow limbs, and even abandoned pileated woodpecker holes. Trees utilized are usually near or above water—often in Sycamore and maples (Mengel 1965). Artificial nest boxes are widely used. Birds forage in shallow water for aquatic plants, insects, and small fish. In the winter, Wood ducks often eat acorns. Within the seep habitat association, wood ducks would be particularly attracted to wooded wetlands and swamps and other areas with standing water and mature trees with cavities.

Northern Harrier – *Circus cyaneus* – This is a species of open country, weedy fields, and marshes. Wooded habitats are not used. Northern Harriers were more prevalent in Kentucky in the past, before the destruction of native prairies. Harriers have bred in small numbers on reclaimed surface mines in the state, nesting amid dense cover of tall grasses. When trees are planted during reclamation...the harriers probably use the mines only for a limited number of years (Palmer-Ball 1996). On the DBNF, this species has been observed over Anso strip mines on the Somerset Ranger District and over large hayfields on the Stearns R.D. (L.Perry, pers. obs.). The northern harrier would be expected to forage over large wetlands with no overstory and a grassy understory.

Sedge Wren – *Cistothorus platensis* – This is a species of low, wet grasslands. Moist meadows and the grassy margins of marshes and bogs are favored. In Kentucky, the birds also inhabit hayfields, overgrown pastures and fallow fields; areas that provide the thick, herbaceous cover the birds require (Palmer-Ball 1996). Nests are in grasses and sedges of weedy fields and in dense clumps of sedges growing in moist spots (Mengel 1965). Larger streamhead wetlands and bogs may be utilized by this species.

Least Bittern – *Ixobrychus exilis* – This bittern species is found around aquatic habitats that have tall vegetation, such as cattails and rushes, in which to conceal themselves and their nests. Swamps, marshes, and pond edges are commonly used. In Kentucky, least bitterns have also

been found nesting in artificial situations, including reservoirs, waterfowl management impoundments, and fish hatchery brood ponds (Palmer-Ball 1996). Foraging is in shallow water, mud, and aquatic vegetation (Hamel 1992). This species would be expected to utilize swamps and wetlands within this habitat association.

Swainson's Warbler – *Limnothlypis swainsonii* – This forest interior species is found within tracts of moist, extensive forest that have dense understory (Palmer-Ball, 1996). Hemlock ravines, having dense growths of rhododendron and laurel, and bottomland forest, with a well-developed understory and/or thickets of small trees, are favored locations. Dense cane breaks are also used. On the DBNF, this bird is often observed in damp, shady hemlock ravines with an understory of rhododendron, near small streams (L.Perry, pers. obs.). The Swainson's warbler would be expected to utilize the wooded wetlands and swamps for breeding provided that a dense understory of shrubs is present.

Hooded Merganser – *Lophodytes cucullatus* – This species of waterfowl requires wooded areas with clear water streams, rivers, swamps, ponds, and lakes with cavity trees present (DeGraaf et. al., 1991). Usually forages in freshwater situations such as swamps, ponds or lakes (Hamel, 1992). This species is seldom found far from floodplain situations and usually requires a good stand of fairly mature forest nearby for nest sites (Palmer-Ball, 1996). They require cavities for nesting and may utilize artificial cavities originally constructed for wood ducks (Bellrose, 1980). Within the seep habitat association, hooded mergansers would be particularly attracted to wooded wetlands and swamps and other areas with standing water and mature trees with cavities.

Pied-billed Grebe – *Podilymbus podiceps* – The destruction of wetland habitat has led to a decrease in numbers of this species. Marshes, water impoundments, and shallow edges of lakes and ponds provide habitat for these birds. Marshy, shallow water with abundant emergent vegetation in which to nest is required during the breeding season. During winter, the birds use similar habitat, but with an increased use of open water. On 13 June 2000, an MSU grad student observed a pied-billed grebe and four young on an USFS-built wetland near Beaver Creek, on the Morehead R.D. (Biebighauser 2001).

Prothonotary Warbler – *Protonotaria citrea* – This species is found in standing water habitats within areas of extensive forest (Hamel, 1992). When birds are seen, they are almost always near the water. Swamps, riparian corridors, bottomlands and floodplains, willow thickets around lakes and ponds, and reservoir margins that contain snags at least 6" dbh provide potential habitat for these cavity-nesters. Somewhat open swamps, with scattered dead stumps or dead trees with cavities, are favored nesting sites. Within the seep habitat association, prothonotary warblers would be particularly attracted to wooded wetlands and swamps and other areas with standing water and mature trees with cavities.

American Woodcock – *Scolopax minor* – This species typically requires moist woodlands in early stages of succession. It may use open fields, cultivated land, pastures and clearings at least ¼ acre in size (DeGraaf et. al., 1991). It generally requires poorly drained soils with an abundance of earthworms for feeding, nearby fields or small forest openings for courtship and roost site (DeGraaf et. al., 1991) and is largely absent from extensive areas of mature forest (Palmer-Ball, 1996). The presences of edge habitat and a high shrub stem density may be

important for nest site selection in some areas (NatureServe, 2001). Appears to be partial to sheltered wet thickets along meandering streams (Barbour et. al., 1973). This species would be attracted to brushy seeps and bogs within the general forest environment.

Louisiana Waterthrush – *Seiurus motacilla* – This forest interior breeding bird frequents rather steep, wooded slopes in riparian areas: especially the banks of rocky, rushing streams. Nests are usually near the water--commonly in crevices at the base of rocks under bank overhangs in heavily shaded areas (Mengel 1965). On the DBNF, the birds are nearly always found where a dense understory of rhododendron or other shrubs shades the stream (L. Perry, pers. obs.). Hamel gives the minimum tract size necessary for the species as 875 ha (1992).

Mammals

Masked Shrew – *Sorex cinereus cinereus* – The masked shrew is associated with higher elevations of the conifer-northern hardwood habitat association. They are found in deep, moist woodlands and prefer areas of thick leaf mold and decaying fallen logs. Masked shrews may occur in small populations on the Redbird Ranger District, DBNF. The species may occur in other forested habitats, particularly near stream head seeps, that have the right conditions to support numerous invertebrate food species and moisture conditions. The dens of masked shrews are located in cavities in logs or snags, under logs or in shallow burrows. In streamside areas they may be found in communities dominated by hemlock/rhododendron. The diet of this species consists of a variety of invertebrates and small vertebrate animals. They prefer moist habitats and access to free water may be important.

Reptiles

Timber Rattlesnake (*Crotalus horridus*) The timber rattlesnake occurs from central Vermont to Iowa in the north and northern Florida to eastern Texas in the south. This rattlesnake inhabits a variety of habitats. In the mountains and foothills it prefers moderately steep, rocky ridge tops with light ground cover. During the fall and spring, timber rattlesnakes are frequently found around rocky ledges with southern exposure. Additional habitats include sphagnum swamps, agricultural fields and second growth clearings. Rock outcrops, old buildings or logs are necessary for winter denning. The timber rattlesnake feeds primarily on small mammals, as well as an occasional bird, amphibian or snake (Mount, 1975; Wilson, 1995)

Northern Coal Skink (*Eumeces anthracinus anthracinus*) The Appalachian population of this subspecies extends into eastern KY, while a disjunct population occurs in the west-central part of the State. Suitable habitat includes damp forests of oak, oak-poplar, oak-hickory-pine, and mixed pine-hardwood with moist soils, abundant leaf litter, logs, and/or loose stones; humid wooded or rocky hillsides; rocky bluffs; and similar areas near water sources, such as streams, springs, swamps, and bogs. These skinks seek the cover of rocks, logs, stumps, brush, and rock slabs. When pursued, they will take refuge in shallow water, hiding under rocks at the bottom. Various rocky areas in which they have been found include: on limestone ledges; in dry leaves beneath rock ledges; beneath flat slabs of sandstone; under rocks in sunlit forest openings and in grassy cut over areas in hardwoods; and under rocks in the slope of a road cut through a mixed forest (VA Dept. of Game and Inland Fisheries 2001). Use of fire to maintain grassy openings within forested stands is of benefit to this species. Coal Skinks feed primarily on insects and spiders.

Southeastern Crowned Snake (*Tantilla coronata*) The southeastern crowned snake ranges from south-central Virginia and southern Illinois to the Florida panhandle and eastern Louisiana. This secretive snake is an excellent burrower, spending much of its time concealed in rotting logs, under bark, stones, leaf litter, pine needles, or burrowed in the soil. The southeastern crowned snake apparently prefers relatively xeric, well-drained soils in pine flatwoods, sandhills and dry hillsides. This snake requires dry habitats with friable soil and sufficient debris for shelter. Females deposit eggs in rotting logs or sawdust piles. The southeastern crowned snake's diet consists of centipedes, spiders, termites, and other small, soft-bodied arthropods. (Wilson, 1995).

Eastern Ribbon Snake – *Thamnophis sauritus sauritus* – This is a semiaquatic species almost always found close to the shallow water of bogs, marshes, swamps, ponds, streams, and weedy lake shorelines. Other low, wet places in which it is encountered include meadows and grassy roadside ditches. Occupied areas tend to be open, but with an abundance of ground cover, such as grasses and sedges, and bushes in which the snakes can sun themselves. These snakes often climb into low vegetation, although rarely more than 4 feet off the ground (Barbour 1971). When startled, they swim on the surface of the water. Deep water is normally avoided, and fleeing Ribbon Snakes skirt the shore, threading their way through vegetation and getting lost from sight with amazing rapidity (Conant and Collins 1991). Their diet consists of small fish and amphibians.

Snails

Delicate Vertigo — *Vertigo bollesiana* — is restricted to Bell and Harlan Counties. It can be found in leaf litter and moss on wooded hillsides within the general forest. *V. bollesiana* has also been recorded from marshes.

PLANTS

Dicots

Yellow Screwstem – *Bartonia virginica* – is a coastal plain species commonly found in moist to wet pine savannas. On the DBNF, it occurs, if at all, in streamhead wetlands and slope seeps. It requires constantly moist conditions and no more than moderate shade. There is some taxonomic confusion between this species and *B. paniculata*, which is more common and which definitely occurs on the forest in the habitat described above.

Brook Saxifrage – *Boykinia acontifolia* – is found throughout its range associated with stream banks. It may also grow in wet meadows. It grows on continually wet, sandy or rocky banks just above summer water levels. It is usually found in moderate shade.

Shaggy Hedge-hyssop – *Gratiola pilosa* – is a coastal plain species which extends interior to the Appalachian Mountains and Arkansas. In Kentucky is known only from the southern portion of the DBNF area. Here it occurs on pond margins, wet meadows and seeps along rivers.

American Water-pennywort – *Hydrocotyle americana* – is a northern species that extends south along the Appalachian Mountains. It grows on usually damp sandy soil, often along streams. On the DBNF, it occurs in only one area, on the sandy floodplain of a stream. The overstory is oak-

yellow pine and the midstory is sparse.

Kidney-leaf Grass-of-Parnassus – *Parnassia asarifolia* – is a species of the Appalachian and Ozarkian provinces. It is commonly found on stream banks and in boggy habitat. On the DBNF, the few locations are from streamhead wetlands in open yellow pine-oak forest. The species requires constantly moist soil and moderate light.

Cross-leaf Milkwort – *Polygala cruciata* var. *cruciata* – is coastal plain species with inland records along the Appalachian Plateaus and in midwestern prairie states. It is known from damp to wet meadows, yellow pine savannas, and bogs. On the DBNF, it is known from wet meadows and open, wet non-forested areas such as warm season grassland.

Slender Marsh-pink – *Sabatia campanulata* – is coastal plain species found in salt or brackish marshes. It occurs inland in a few areas. The DBNF sites are from wet meadows.

New York Ironweed – *Vernonia noveboracensis* – is a coastal plain species with scattered interior stations. It is found in open floodplain forest, roadside ditches, marshes, and other wet places. On the DBNF, the species is found in streamhead wetlands and occasionally in roadside ditches. A canopy may be present, but if so, the midstory and shrub layers are sparse.

Ferns

Engelmann's Quillwort – *Isoetes engelmannii* – is a semi-aquatic species. The plants can survive entirely submerged, or for several months out of water if the soil remains moist. At the time spores are released, the leaf bases must be submerged for sexual reproduction to be successful. The plants are generally in shallow water (under 2 feet deep) and are found in both permanent and seasonal water including ruts, roadside ditches, ponds, lake margins, and occasionally in streamhead wetlands and streams.

Liverworts

Liverwort – *Telarania nematodes* – is associated with wetlands throughout its range. On the DBNF, it is known from only a few slope seeps, but probably occurs in others and streamhead seeps. The species grows in and on top of other bryophytes, in particular sphagnum mosses. It requires constant moisture, high humidity and moderate shade, which may be provided by the sphagnum or herbaceous plants growing in the wetlands.

Monocots

Cane – *Arundinaria gigantea* – is a riparian species that also grow in upland habitats. It often forms extensive monocultures (or nearly so) called cane brakes. These areas were maintained in part by fire. Cane brakes are most common along open riparian areas subject to infrequent flooding, but do occasionally occur in upland areas.

Atlantic Caric Sedge – *Carex atlantica* (ssp. *atlantica*) – is a coastal plain species that grows in areas that remain wet throughout the year such as swamps and bogs. On the DBNF, it is associated with streamhead wetlands, slope seeps and swamps. It may also occur in wet

meadows. It grows in clumps forming thick to thin mats of vegetation. Shade is usually moderate to light.

Pond Caric Sedge – *Carex jorii* – is a coastal plain species found associated with areas that remain wet throughout its range, primarily swamps and wet woods. On the DBNF, it is a semi-aquatic species found only in and at the edge of, a few, apparently natural, ponds. These ponds occasionally dry, but the soil remains saturated.

Caric Sedge – *Carex seorsa* – is a wet forest species with a range over much of the eastern US. It grows in areas that remain wet throughout the year. On the DBNF, it is associated with a few streamhead wetlands and slope seeps. It grows in clumps forming thick to thin mats of vegetation. Shade is usually moderate to light.

Uptight Caric Sedge – *Carex stricta* – is similar to and easily confused with streamside caric sedge. Its range is primarily the northern US, but with extensions into the Appalachian Mountains. This species may grow along streamsides in gravel or mud bars subjected to flooding, but is more commonly found in swamps. It forms tight clumps, which are usually in several inches of standing water. The water is often stagnant. The canopy provides moderate to heavy shade. The DBNF stations are in swamps.

Grass-pink – *Calopogon tuberosus* – is a coastal plain species found in wet to moist pine savannas, roadside ditches, pitcher plant bogs, and other open, wetland habitats. A few historic Kentucky stations occurred in dry, sandy soil on ridgetops under open oak or oak-yellow pine forest. On the DBNF, a few extant stations are known from streamhead wetlands, slope seeps or wet warm season grassland. It may have occurred on drier sites in the past. The species requires constant moisture and more or less open conditions.

Appalachian Spreading Pogonia – *Cleistes bifaria* – ranges from the Appalachian Plateaus to the Piedmont. It is found in a variety of sites ranging from glades to open forest to warm season grassland to streamhead wetlands. It occurs on well-drained substrates (on hummocks in wetlands) usually in open or partially open conditions. The plants can be single or occur in colonies. On the DBNF, it is known from glades, streamhead wetlands, seep slopes, and on road cuts in upland oak forest. Fire enhances flowering and total numbers of plants. Fire probably helps to maintain habitat as well.

Pink Lady's-slipper – *Cypripedium acaule* – across its range, occurs in acid forests or wetlands (usually sphagnum bogs). On the DBNF, pink lady-slipper is found in upland oak and mixed pine-oak woods, and occasionally on hummocks within seeps and streamhead wetlands. It occurs in light to heavy shade, but does not seem to flower unless in somewhat open conditions. This species responds well to burning. It is not uncommon to find 3-4 dozen plants in flower and as many more in vegetation condition following a fire where only a dozen or so were found before. The species is experiencing collection pressure from root diggers. Digging of this species is not permitted on the DBNF.

Small Yellow Lady's-slipper – *Cypripedium parviflorum* var. *parviflorum* – ranges from Canada to the southern Appalachian Mountains. It is most common to the north. It grows in sphagnum

bogs and hemlock- white pine woods northward. On the DBNF, a few sites are known, all from open oak forest on lower slopes.

Loesel's Twayblade – *Liparis loeselii* – is a northern and midwestern North American species. It is found in wet to damp forest. On the DBNF, it is known from wet seeps on roadsides, a seep at the base of an abandoned limestone quarry, and at the edge of a strip mine pond.

Goldenclub – *Orontium aquaticum* – is a coastal plain species with scattered stations inland on the Cumberland Plateau. It is found in shallow water slow water and swamps. On the DBNF, it is found in quiet backwater along rivers and streams at the southern end of the forest.

Clubspur Orchid – *Platanthera clavellata* – orchid occurs in a wide variety of habitats across its range. On the DBNF, it occurs in streamhead wetlands, in seeps, on streambanks, and in swamps. It is usually found in mucky soil under moderate to heavy shade. The soil in which it occurs is always damp or wet. This species is an alternative host to the endophyte fungus that is the sole fungal associate for white fringeless orchid (*P. integrilabia*). Maintaining this orchid helps to maintain a diverse stock for the fungal symbiont.

Yellow Crested Orchid – *Platanthera cristata* – occurs in a wide variety of habitats across its range. On the DBNF, it occurs in streamhead wetlands, seeps, and in permanently damp to wet areas in warm season grassland. It occurs in low to moderate shade conditions. This species is an alternative host to the endophyte fungus that is the sole fungal associate for white fringeless orchid (*P. integrilabia*). Maintaining this orchid helps to maintain a diverse stock for the fungal symbiont

White Fringeless Orchid – *Platanthera integrilabia*– on the DBNF is found in streamhead seeps, or rarely streambanks in the vicinity of streamhead wetlands. This species requires the sterile, constantly wet to moist sandy soil found in this habitat. Water in these seeps is always flowing at least below the surface, and is never stagnant. It is possible that this helps keeps the species endophyte fungus associate from damaging the plant. The species almost always grows in mats of *Sphagnum* mosses, but occasionally is associated with leaf litter or a thin layer of organic muck. It is probable *Sphagnum* helps to maintain moisture and soil pH. It is also known to serve as a nursery for seed germination. The canopy associated with these seeps ranges from open to closed. The open conditions encourage butterfly-attracting species such as *Eupatorium fistulosum*, which in turn increase the chances of pollination of the orchid flowers. The closed canopy condition may improve germination and establishment of seedlings.

Small Purple-fringed Orchid – *Platanthera psycodes* – is a northern species with a range extension south along the Appalachian Mountains. It is found in wet meadows and wet, open forest. On the DBNF, there are tentative records for this species from wet stream terraces under high canopy closed forest. The identity of the plants in question is not certain.

Rose Pogonia – *Pogonia ophioglossoides* – is found in open, boggy ground, scattered through the eastern US. In the DBNF area, it is known from one, maybe two sites. One is open, wet warm season grassland under a powerline right-of-way. The other site is a sphagnum slope seep.

Yellow-eyed grass – *Xyris caroliniana* – is not found in the state. It is a misidentification which has been tracked erroneously. The specimens are referable to *X. torta* (Medley, 1993)

Yellow-eyed Grass – *Xyris difformis* var. *difformis* – is a coastal plain and lake state species found in bogs and saturated sandy shores. The one Kentucky record, in the DBNF area, is from a wet, sandy meadow.

Yellow-eyed Grass – *Xyris torta* – is a coastal plain and lake state species found in bogs and wet, sandy soil of open yellow pine forest and grasslands. The DBNF records are from streamhead wetlands, slope seeps, and wet warm season grasslands and meadows.

Mosses

Sphagnum Moss – *Sphagnum bartlettianum* – is a coastal plain species where it is common. On the DBNF, it is uncommon and is found only associated with streamhead wetlands and slope seeps. It requires constantly moist conditions, although is somewhat tolerant of short term drying. The species sometimes serves as a growing substrate or substrate moderator for *Telarania nematodes* and *Platanthera* species.

Sphagnum Moss – *Sphagnum magellanicum* – is a coastal plain species where it is common. On the DBNF, it is uncommon and is found only associated with streamhead wetlands and slope seeps. It requires constantly moist conditions, although is somewhat tolerant of short term drying. The species sometimes serves as a growing substrate or substrate moderator for *Telarania nematodes* and *Platanthera* species.

Sphagnum Moss – *Sphagnum macrophyllum* – is a coastal plain species ranging from Newfoundland to Florida then west to Texas. It is known from the Cumberland Plateau in Tennessee and Kentucky. The Kentucky site is on the Morehead District of the DBNF. Throughout its range it is found in shallow, quiet water in lakes, ponds, roadside ditches, and southward in gum-cypress swamps. On the DBNF, it is known from one small pond near Cave Run Lake, where it covers much of the surface.

Sphagnum Moss – *Sphagnum palustre* – is widespread. Throughout its range it is found in sites which are constantly moist. It does tolerate periodic drying, but portions may die. On the DBNF, it is found in streamhead wetlands, swamps, slope seeps, and along stream margins. The latter habitat is the least common. This species is important as it helps maintain moisture and pH regimes in wetland sites where other plant and animal species find habitat. The species sometimes serves as a growing substrate or substrate moderator for *Telarania nematodes* and *Platanthera* species.

References:

- Barbour, R.W. 1971. Amphibians and reptiles of Kentucky. The University Press of Kentucky. Lexington, KY.
- Barbour, R.W., C.T. Peterson, D. Rust, H.E. Shadowen and A.L. Whit. 1973. Kentucky Birds: a finding guide. The University Press of Kentucky. Lexington, KY. 305 pp.
- Behler, J.L. and F.W. King. 1979. The Audubon Society field guide To North American
Bellrose, F.C. 1980. Ducks, Geese, and Swans of North America. Wildlife Management Institute. Stackpole Books. Harrisburg, PA. 540 pp.

- Biebighauser, T. 2001. "Uncommon wetland bird observations" Unpublished field notes. USDA Forest Service, Daniel Boone National Forest, Morehead Ranger District.
- Conant, R. and J.T. Collins. 1991. Peterson field guide to reptiles and amphibians: eastern and central North America. 3rd ed. Houghton Mifflin. Boston, MA
- DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and Rangeland Birds of the United States: natural history and habitat use. U.S. Department of Agriculture Handbook 688. 625 pp.
- DeGraff, R. M., and D.D. Rudis. 1986. New England Wildlife: Habitat, natural history, and distribution. NE Forest Experiment Station. US Forest Service. General Technical Report NE-108. 481p.
- Hairston, N.G. 1949. The local distribution and ecology of the plethodontid salamanders of the southern Appalachians. Ecol. Monogr. 19:47-73.
- Hamel, P.B. 1992. Land Manager's Guide to Birds of the South. The Nature Conservancy, Southeastern Region. Chapel Hill, NC. 437 pp.
- Martof, B.S., W.M. Palmer, J.R. Bailey, and J.R. Harrison, Jr. 1980. Amphibians and Reptiles of the Carolinas and Virginia. University of North Carolina Press. Chapel Hill, NC. 264 pp.
- Mengel, R.M. 1965. The Birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union. The Allen Press. Lawrence, KS. 581 pp.
- Morehead Inventory
- Mount, R.H. 1975. The reptiles and amphibians of Alabama. Auburn Univ. Agric. Exp. Sta. Auburn, AL; 347 pp.
- NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Association for Biodiversity Information, Arlington, VA. Available: <http://www.natureserve.org/>. Accessed: July 25, 2001.
- Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky. Lexington, KY. 372 pp.
- Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.
- Storm Damage DEIS (Source provided by lit searchers; on list?)
- Tilley, S.G. 1973c. *Desmognathus ochrophaeus*. Cat. Amer. Amphib. Rept.: 129.1-29.4.
- USDI, U.S. Geological Survey, Northern Prairie Wildlife Research Center, Jamestown, ND. June 2001.

07/15/2003

VA Dept of Game and Inland Fisheries: VA Fish and Wildlife Information Service. 2001.
Available: <http://www.dgif.state.va.us/>. Accessed July 26, 2001.

Wilson, L.A. 1995. Land Manager's Guide to the Amphibians and Reptiles of the South. The Nature Conservancy, Southeastern Region. Chapel Hill, NC; and the U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA.

07/15/2003

Attachment C.

Seeps/Swamps Habitat Association Matrix

Association	Habitat	Modifier	Class	Common/Species
14-Seeps/ Swamps	Seeps/Bogs-including slopes, not streamhead	(blank)	GASTR	Delicate vertigo/ <i>Vertigo bollesiana</i>
			P-DIC	Slender Marsh-pink/ <i>Sabatia campanulata</i>
			P-MOS	Large-leaved sphagnum/ <i>Sphagnum macrophyllum</i>
		Acidic Substrate		Magellan's Sphagnum Moss/ <i>Sphagnum magellanicum</i>
		Dense shrub understory	BIRD	Louisiana Waterthrush/ <i>Seiurus motacilla</i>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		Downed Logs	REPT	Northern Coal Skink/ <i>Eumeces antracinus antracinus</i>
		Forb/Grass Condition	BIRD	American Woodcock/ <i>Scolopax minor</i>
		Forest Interior (Minimal Edge)		Louisiana Waterthrush/ <i>Seiurus motacilla</i>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		High Shade		Louisiana Waterthrush/ <i>Seiurus motacilla</i>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		Low (wet, i.e. subject to holding water)		Northern Harrier/ <i>Circus cyaneus</i>
				Sedge Wren/ <i>Cistothorus platensis</i>
		Moderate Shade	P-MOS	Sphagnum Moss/ <i>Sphagnum palustre</i>
				Streamhead sphagnum/ <i>Sphagnum palustre</i>
		Moist	BIRD	American Woodcock/ <i>Scolopax minor</i>
				Sedge Wren/ <i>Cistothorus platensis</i>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
			P-MON	Loesel's Twayblade/ <i>Liparis loeselii</i>
		Open (Little or No Shade)	BIRD	Northern Harrier/ <i>Circus cyaneus</i>
			P-DIC	Shaggy Hedge-hyssop/ <i>Gratiola pilosa</i>
		Rich Soil	BIRD	American Woodcock/ <i>Scolopax minor</i>
		Riparian		Louisiana Waterthrush/ <i>Seiurus motacilla</i>
		Rocky/Rocks	AMPHI	Mountain Dusky Salamander/ <i>Desmognathus ochrophaeus</i>
			BIRD	Louisiana Waterthrush/ <i>Seiurus motacilla</i>
			P-MOS	Magellan's Sphagnum Moss/ <i>Sphagnum magellanicum</i>
			REPT	Northern Coal Skink/ <i>Eumeces antracinus antracinus</i>
		Shrub/Sapling Condition	BIRD	American Woodcock/ <i>Scolopax minor</i>
		Slope (hillside, steepness)		Louisiana Waterthrush/ <i>Seiurus motacilla</i>
		Soil (bare)	P-MOS	Sphagnum Moss/ <i>Sphagnum palustre</i>
				Streamhead sphagnum/ <i>Sphagnum palustre</i>
		Sphagnum Associate	P-MON	Rose Pogonia/ <i>Pogonia ophioglossoides</i>
		Tract Size (Area Sensitive)	BIRD	Louisiana Waterthrush/ <i>Seiurus motacilla</i>
				Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		Water (Distance Sensitive)		Louisiana Waterthrush/ <i>Seiurus motacilla</i>
			REPT	Northern Coal Skink/ <i>Eumeces antracinus antracinus</i>

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
	Streamhead Seeps and Wetlands	(blank)	AMPHI	Wood Frog/ <i>Rana sylvestris</i>
			P-DIC	American Water-pennywort/ <i>Hydrocotyle americana</i>
				Brook Saxifrage/ <i>Boykinia acontifolia</i>
				Cross-leaf Milkwort/ <i>Polygala cruciata</i> var. <i>cruciata</i>
				Kidney-leaf Grass-of-Parnassus/ <i>Parnassia asarifolia</i>
				New York Ironweed/ <i>Vernonia noveboracensis</i>
			P-MON	Appalachian Spreading Pogonia/ <i>Cleistes bifaria</i>
				Caric Sedge/ <i>Carex atlantica</i>
				Clubspur Orchid/ <i>Platanthera clavellata</i>
				Grass-pink/ <i>Calopogon tuberosus</i>
				Rose Pogonia/ <i>Pogonia ophioglossoides</i>
				Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
				White Fringeless Orchid/ <i>Platanthera integrilabia</i>
				Yellow-crested Orchid/ <i>Platanthera cristata</i>
			P-MOS	Large-leaved sphagnum/ <i>Sphagnum macrophyllum</i>
			REPT	Eastern Ribbon Snake/ <i>Thamnophis sauritus sauritus</i>
		Acidic Substrate	P-DIC	Brook Saxifrage/ <i>Boykinia acontifolia</i>
				Cross-leaf Milkwort/ <i>Polygala cruciata</i> var. <i>cruciata</i>
				Yellow Screwstem/ <i>Bartonia virginica</i>
			P-MON	Grass-pink/ <i>Calopogon tuberosus</i>
				Pink Lady-slipper/ <i>Cypripedium acaule</i>
				Yellow-crested Orchid/ <i>Platanthera cristata</i>
			P-MOS	Magellan's Sphagnum Moss/ <i>Sphagnum magellanicum</i>
		Cool Temperatures	P-MON	Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
		Dense shrub understory	BIRD	Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		Downed Logs	MAMM	Masked Shrew/ <i>Sorex cinereus cinereus</i>
		Forb/Grass Condition	BIRD	American Woodcock/ <i>Scolopax minor</i>
		Forest Interior (Minimal Edge)		Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
		High Shade		Swainson's Warbler/ <i>Limnothlypis swainsonii</i>
			P-MON	Clubspur Orchid/ <i>Platanthera clavellata</i>
		High/Constant Humidity (Microclimate)	P-LIV	A Liverwort/ <i>Telerania nematodes</i>
		Low (wet, i.e. subject to holding water)	AMPHI	Mountain Dusky Salamander/ <i>Desmognathus ochrophaeus</i>
			BIRD	Northern Harrier/ <i>Circus cyaneus</i>
				Sedge Wren/ <i>Cistothorus platensis</i>
		Moderate Shade	P-DIC	Kidney-leaf Grass-of-Parnassus/ <i>Parnassia asarifolia</i>
			P-FER	Quillwort/ <i>Isoetes englemannii</i>
			P-MON	Caric Sedge/ <i>Carex seorsa</i>
				Small Purple-fringed Orchid/ <i>Platanthera psycodes</i>
				White Fringeless Orchid/ <i>Platanthera integrilabia</i>
				Yellow-crested Orchid/ <i>Platanthera cristata</i>
			P-MOS	Sphagnum Moss/ <i>Sphagnum palustre</i>
				Streamhead sphagnum/ <i>Sphagnum palustre</i>
		Moist	BIRD	American Woodcock/ <i>Scolopax minor</i>

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
				Sedge Wren/ Cistothorus platensis
				Swainson's Warbler/ Limnothlypis swainsonii
		Open (Little or No Shade)	BIRD	Northern Harrier/ Circus cyaneus
			P-MON	Cypress-swamp Caric Sedge/ Carex joorii
				Small Yellow Lady's-slipper/ Cypripedium parviflorum var. parviflorum
				Uptight Caric Sedge/ Carex stricta
		Rich Soil	BIRD	American Woodcock/ Scolopax minor
		Rocky/Rocks	AMPHI	Black Mountain Salamander/ Desmognathus welteri
			P-MOS	Magellan's Sphagnum Moss/ Sphagnum magellanicum
				Sphagnum Moss/ Sphagnum palustre
				Streamhead sphagnum/ Sphagnum palustre
		Sandy Soil	P-MON	White Fringeless Orchid/ Platanthera integrilabia
			P-MOS	Bartlett's Sphagnum Moss/ Sphagnum bartlettianum
				Red Sphagnum/ Sphagnum bartlettianum
		Seasonal (water)	REPT	Eastern Ribbon Snake/ Thamnophis sauritus sauritus
		Seep/Constant Water	AMPHI	Green Frog/ Rana clamitans
			P-FER	Quillwort/ Isoetes englemannii
			P-MON	Goldenclub/ Onontium aquaticum
		Shrub/Sapling Condition	BIRD	American Woodcock/ Scolopax minor
		Sphagnum Associate	P-MON	Pink Lady-slipper/ Cypripedium acaule
				White Fringeless Orchid/ Platanthera integrilabia
				Yellow-eyed Grass/ Xyris caroliniana
		Tract Size (Area Sensitive)	BIRD	Swainson's Warbler/ Limnothlypis swainsonii
	Swamp (wooded wetland)	(blank)	AMPHI	Green Frog/ Rana clamitans
			BIRD	Hooded Merganser/ Lophodytes cucullatus
				Least bittern/ Ixobrychus exilis
			P-DIC	American Water-pennywort/ Hydrocotyle americana
				Slender Marsh-pink/ Sabatia campanulata
				Small-flowered Thoroughwort/ Eupatorium semiserratum
				Yucca-leaved Rattlesnake Master/ Eryngium yuccifolium
			P-MON	Appalachian Spreading Pogonia/ Cleistes bifaria
				Cane/ Arundinaria gigantea
				Caric Sedge/ Carex atlantica
				Caric Sedge/ Carex seorsa
				Clubspur Orchid/ Platanthera clavellata
				Small Purple-fringed Orchid/ Platanthera psycodes
				Uptight Caric Sedge/ Carex stricta
				Yellow-crested Orchid/ Platanthera cristata
				Yellow-eyed Grass/ Xyris caroliniana
				Yellow-eyed Grass/ Xyris difformis
				Yellow-eyed Grass/ Xyris tortula
			REPT	Timber Rattlesnake/ Crotalus horridus
		Acidic Substrate	P-MON	Caric Sedge/ Carex seorsa

07/15/2003

Association	Habitat	Modifier	Class	Common/Species
		Burrows, Holes, Tunnels (Secondary Users)	AMPHI	Marbled Salamander/ Ambystoma opacum
		Downed Logs	AMPHI	Jefferson Salamander/ Ambystoma jeffersonianum
			REPT	Southeastern Crowned Snake/ Tantilla coronata
		Forest Interior (Minimal Edge)	BIRD	Prothonotary warbler/ Protonotaria citrea
		High Shade	P-MON	Clubspur Orchid/ Platanthera clavellata
		Low (wet, i.e. subject to holding water)	AMPHI	Marbled Salamander/ Ambystoma opacum
		Moderate Shade	P-MON	Clubspur Orchid/ Platanthera clavellata
		Open (Little or No Shade)	REPT	Eastern Ribbon Snake/ Thamnophis sauritus sauritus
		Rocky/Rocks	AMPHI	Marbled Salamander/ Ambystoma opacum
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus
				Southeastern Crowned Snake/ Tantilla coronata
		Sandy Soil	P-MOS	Bartlett's Sphagnum Moss/ Sphagnum bartlettianum
				Red Sphagnum/ Sphagnum bartlettianum
		Seasonal (water)	AMPHI	Marbled Salamander/ Ambystoma opacum
		Seep/Constant Water	P-FER	Quillwort/ Isoetes englemannii
			P-MON	Upright Carex Sedge/ Carex stricta
		Snags > 6" dbh	BIRD	Prothonotary warbler/ Protonotaria citrea
				Wood Duck/ Aix sponsa
		Tract Size (Area Sensitive)		Prothonotary warbler/ Protonotaria citrea
		Tree and Snags (Cavity Nesters)		Hooded Merganser/ Lophodytes cucullatus
				Prothonotary warbler/ Protonotaria citrea
				Wood Duck/ Aix sponsa
		Water (Distance Sensitive)	BIRD	Hooded Merganser/ Lophodytes cucullatus
				Least bittern/ Ixobrychus exilis
				Pied-billed Grebe/ Podilymbus podiceps
				Prothonotary warbler/ Protonotaria citrea
				Wood Duck/ Aix sponsa
			REPT	Northern Coal Skink/ Eumeces antracinus anthracinus

Viability Assessment Report For Lake and Pond Margins Habitat Association

Prepared by
John R. Omer
Daniel Boone National Forest

I. Description of the Habitat Association

The margins of standing bodies of water include the littoral zone that consists of the area of shallow water where light penetrates to the bottom and is typically occupied by rooted plants (Odum, 1971). The margin habitat would also include areas of the shore that are kept wet through wave action. These communities include photosynthetic primary producers and the groups that depend on them (Cole, 1994).

The physiographic position, geology, soils, hydrology, and dominant vegetation all vary with the actual location of each body of water. All of these factors plus the size, depth, age, and permanence of the body of water play an important role in the physical, chemical and biological makeup of these aquatic environments.

Location

Large and small lakes, ponds, temporary and permanent shallow water pools, occur throughout most of the Daniel Boone National Forest (DBNF). Their size and distribution are widely variable. For this report a lake is any permanent body of water with a surface area greater than or equal to five acres and a pond is any permanent body of water with a surface area less than five acres. There are 12 lakes and approximately 300 mapped ponds on the DBNF with approximately 445 and 30 miles of shoreline respectively (USDA Forest Service, 1996). In addition to the lakes and ponds, numerous (possibly more than 1500) ridge-top, seasonal and forested pools have been established on the DBNF primarily on the Morehead and Stanton Districts (Biebighauser, 2001).

Geology, Hydrology and Dominant Vegetation

The DBNF contains parts of several physiographic regions or ecological subsections and portions of three major river systems, the Cumberland, Kentucky and Licking rivers. The Forest also lies within or is bordered by several sections and subsections within the Eastern Broadleaf Forest provinces and the Central Appalachian Broadleaf-Coniferous Forest Province. The western part of the DBNF lies primarily within the Northern Escarpment, Southwestern Escarpment and Low Hills Belt subsections of the Northern Cumberland Plateau Section and is bordered to the west by the Highland Rim and Bluegrass sections. The eastern part of the DBNF lies primarily within the Rugged Eastern Hills subsection. The southern and southeastern boundaries of the Forest also encompass the Jellico Mountains subsection of the Cumberland Mountains Section (USDA Forest Service 2001). Vegetation

will vary with the size and type of water body. Seasonal ponds of all types may have rushes, bulrushes, caric sedges, Nepal browntop and lowland buttonweed. Shallow permanent ponds will frequently have ceric sedges, rushes, bulrushes, reedtop panic grass, Swamp Beggar's-tick and Carolina willow. Larger deep ponds and smaller lakes may have cattail, Woolly Bulrush and black and Carolina willow. Margins of larger lakes with heavy wave action and fluctuating water levels may have vegetation restricted to woody plants such as sycamore and willow. Some annual plants may also occur here, smartweed, Nepal browntop, hierba de yago, lowland buttonweed, cattail and at least one site with phragmites. Precipitation in the area occurs throughout the year with seasonal variation.

II. Current Status of the Habitat Association on the Daniel Boone National Forest

The landscape of the area that is now the DBNF has changed dramatically since the 1800's when the dominant use was small-scale subsistence farming. Logging and land clearing for agriculture accelerated in the early 1900's, and by 1930 most of eastern Kentucky had been cleared. Faced with economic necessity, many people either abandoned or sold their land to the Federal Government in the 1920's and 1930's under the Weeks Act. The law allowed the Federal Government to begin buying land, in 1937, for what was eventually to become the DBNF. From the 1920's to the 1970's mining companies stripped and deep mined coal on adjacent private lands (USDA Forest Service, 2001).

Historically, natural bodies of standing water may have been more common than they are today in what is now the DBNF. Beginning in the 1940's many small ponds were established for watering livestock on private land through programs administered by the Soil Conservation Service (Biebighauser, 2001). When this land was acquired for the DBNF some tracts had these existing standing water bodies on them. Ponds were established on the DBNF to provide water for forest fire suppression in the 1960's. A number of small lakes were established in the early 1970's by the Soil Conservation Service for flood control as directed by Public Law 566 (Biebighauser, 2001). Past and current DBNF practices have established and maintained numerous water sources for a variety of purposes. This has increased the total number of individual bodies of water on the Forest.

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The majority of the lakes, ponds, and other standing water found on the DBNF are man-made. The margins of these bodies of water form unique habitats and are used by numerous species for which continued expectation of existence on the forest is at risk (see Attachment A). Habitat management includes protection and improvement and in some cases creating more bodies of standing water, to ensure species viability. Protection involves preventing actions or alterations, to the habitat, that adversely affect species viability.

The desired goal would be to maintain or exceed State water quality standards for aquatic biodiversity. Maintain and restore water quality necessary to support healthy aquatic ecosystems and to ensure survival, growth, reproduction, and migration of aquatic dependent species. Maintain and/or restore the biological, physical, and chemical integrity of aquatic ecosystems (USDA Forest Service, 2001).

The desired future condition of this habitat association is to maintain, improve, and/or establish more standing water within the Forest. Manage land surrounding these areas in a way that enhances or does not negatively impact the species viability of organisms living there. Ensure a high likelihood that species within this association will persist or increase on the forest over the planning period.

Forest-Wide Standards

- Follow direction in FSM 2630 (Management of Wildlife and Fish Habitat) and FSM 2670 (Threatened, Endangered, and Sensitive Plants and Animals).
 - *Rationale: These provide guidance for management decisions specific to wildlife, fish, and PETS species.*
- Follow guidelines in FSH 2609.13 (Wildlife and Fisheries Program Management Handbook).
 - *Rationale: These provide guidance for management decisions specific to wildlife and fisheries.*
- Meet or exceed all Federal, State, and local water quality standards for aquatic biodiversity.
 - *Rationale: The National Forest Management Act of 1976 requires the Forest Service to maintain or enhance water quality, which turn helps maintain healthy aquatic ecosystems.*
- Create more ponds and temporary and permanent shallow water pools throughout the DBNF.
 - *Rationale: The majority of these bodies of water are concentrated on the Morehead and Stanton Ranger Districts. It has been shown that the margins of these pools are used by species at risk of losing population viability on the DBNF. Creating more pools and thus more margins may increase these species viability.*
- National Forest vegetation management will not be proposed in the areas adjacent to these small lakes, ponds, or areas of standing water unless the objective of the management is habitat improvement or will have beneficial or no adverse effect on species that use this association.
 - *Rationale: Management activities are sometimes necessary to maintain or enhance individual species habitats.*
- Manage special dispersed recreation activities. Schedule and regulate use of facilities, time of year, number of users, and designate use areas.
 - *Rationale: Limit adverse impact on species that use these aquatic areas as habitat.*

- Supplement habitat with naturally and artificially created nesting, roosting, and perching structures if these are limiting factors. Provide wood duck nest boxes and create snags in appropriate habitat.
 - *Rationale: Species viability may be increased if these are limiting factors in the area.*
- Provide fish attractors in areas with limited cover in ponds and lakes of appropriate size.
 - *Rationale: Increase lake and pond productivity for species dependent of on fish as a food source, such as the bald eagle, wood duck, and hooded merganser.*
- Comply with water goals as specified in the Clean Water Act and other Congressional mandates.
 - *Rationale: The Clean Water Act mandates the maintenance of biological integrity; this will help to enhance and maintain habitat viability.*
- Determine if the applicable water quality standards are being met.
 - *Rationale: This will help insure maintenance or improvement of the habitat association and the viability of the species that inhabit it.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

There are several species that use the margins of these scattered bodies of water that are at risk of losing their population viability (see Attachment A). Inventories should be conducted to collect baseline data on the presence, population size, and timing and frequency of use by these species.

- Habitat persistence and health should be regularly monitored while periodic monitoring should be conducted to insure individual species viability. This could be accomplished in cooperation with KDFWR and other state and federal agencies. (Moderate priority)
- If the current status of a species in this habitat association is not known, then inventory of species that are potentially at risk of losing population viability should be carried out. The general strategy is to document existing habitat and/or species condition and status, and then assess for degradation or potential improvement. (High priority)

Information on the location, dimensions, and type of water bodies on the DBNF should be collected and entered into a GIS database. This information would be used in the management of species at risk of losing population viability that use these habitats and would help determine whether there is a need to establish more of this habitat type. It would also be used in management decisions on the DBNF to prevent potentially adverse impacts to these species. (High priority)

References:

- Biebighauser, Thomas R. Wildlife Biologist, USDA Forest Service, Morehead Ranger District. personal communication.
- Cole, Gerald A. 1994. Textbook of Limnology. Waveland Press, Inc. Project Heights, IL. 412 pp.
- Odum, Eugene P. 1971. Fundamentals of Ecology. W. B. Saunders Company. Philadelphia, PA. [574 pp.]
- USDA Forest Service, Center for Aquatic Technology Transfer. 2001. An Assessment and Strategy for Conservation of Aquatic Resources on the Daniel Boone National Forest, Interim Report, April 2001. Blacksburg, VA. [166 pp.]
- USDA Forest Service, Center for Aquatic Technology Transfer. 2001. An Assessment and Strategy for Conservation of Aquatic Resources on the Daniel Boone National Forest, Interim Report, April 2001. Blacksburg, VA. [166 pp.]
- USDA Forest Service. 1988. Final Environmental Impact Statement, Daniel Boone National Forest, Land and Resource Management Plan. Winchester, KY.
- USDA Forest Service. 1996. Landtype association GIS coverage. U. S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.
- USDA Forest Service. 1980, as amended. The Forest Service Handbook. U.S. Department of Agriculture, Forest Service, Washington, D.C.
- USDA Forest Service. 1980 as amended. The Forest Service Manual. U.S. Department of Agriculture, Forest Service, Washington, D.C.

Attachment A.**Species List: Lake and Pond Margin Habitat Association**

CLASS	Common Name/ <i>Species</i>
AMPHIBIAN	Four-toed Salamander/ <i>Hemidactylum scutatum</i> Mudpuppy/ <i>Necturus maculosus</i>
BIRD	Wood Duck/ <i>Aix sponsa</i> Least bittern/ <i>Ixobrychus exilis</i> Hooded Merganser/ <i>Lophodytes cucullatus</i> Pied-billed Grebe/ <i>Podilymbus podiceps</i> Prothonotary warbler/ <i>Protonotaria citrea</i>
FISH	Rock Bass/ <i>Ambloplites rupestris</i> Muskellunge (Native Pop. only)/ <i>Esox masquinongy</i> (Cave Run Lake) Northern Hogsucker/ <i>Hypentelium nigricans</i> Bluegill/ <i>Lepomis macrochirus</i> Smallmouth Bass/ <i>Micropterus dolomieu</i> Largemouth Bass/ <i>Micropterus salmoides</i> Yellow Perch/ <i>Perca flavescens</i> White Crappie/ <i>Pomoxis annularis</i> Walleye (Native pop. only)/ <i>Stizostedion vitreum</i>
INSECTS	Pygmy Snaketail/ <i>Ophiogomphus howei</i>
MAMMAL	Beaver/ <i>Castor canadensis</i>
PLANTS	Shaggy Hedge-Hyssop/ <i>Gratiola pilosa</i> Engelmann's Quillwort/ <i>Isoetes engelmannii</i> Vetchling Peavine/ <i>Lathyrus palustris</i> Loesel's Twayblade/ <i>Liparis loeselii</i> Spotted Pondweed/ <i>Potamogeton pulcher</i> Sweet Waterlily/ <i>Nymphaea odorata</i> Sphagnum Moss/ <i>Sphagnum macrophyllum</i> Shining Ladies'-Tresses/ <i>Spiranthes lucida</i> Eelgrass/ <i>Vallisneria americana</i>
REPTILES	Eastern Ribbon Snake/ <i>Thamnophis sauritus sauritus</i>

Attachment B.

Pond and Lake Margins Species/Habitat Relationships with References

AMPHIBIANS

Four-toed salamander – *Hemidactylum scutatum* – The four-toed salamander is usually associated with sphagnum bogs or slow-moving streams with abundant moss or sedges adjacent to woodland areas. Adults live under rocks, logs, leaves or moss in maple-beech and other hardwood forests. They can also be observed in coniferous woods such as loblolly, short-leaf pine, and Virginia pines. The larvae live in pools, bogs or slow-moving streams with moss or sedges (Neill, 1963). The four-toed salamander is terrestrial as an adult, requiring woodlands near sphagnum ponds, streams or bogs. The larvae are aquatic and require a permanent water source. The four-toed salamander is an opportunistic feeder with a diet consisting of small arthropods and worms. (Wilson, 1995).

Mudpuppy – *Necturus maculosus* – The mudpuppy is entirely aquatic, inhabiting lakes, pond, rivers, streams, and other permanent bodies of water. They prefer either weedchoked waters or those with abundant shelter in the form of debris, rocks, mud, and/or leaf beds. They require unpolluted, clean water (Wilson, 1995)

BIRDS

Wood Duck – *Aix sponsa* – These birds live around a variety of aquatic habitats that have cavities available for nesting. Swamps, wooded streams, lakes, ponds, reservoirs, and marshes provide suitable habitat. Nesting is in live or dead trees, within cavities, hollow limbs, and even abandoned pileated woodpecker holes. Trees utilized are usually near or above water—often in sycamore and maples (Mengel, 1965). Artificial nest boxes are widely used. Birds forage in shallow water for aquatic plants, insects, and small fish. In the winter, wood ducks often eat acorns.

Least Bittern – *Ixobrychus exilis* – This bittern species is found around aquatic habitats that have tall vegetation, such as cattails and rushes, in which to conceal themselves and their nests. Swamps, marshes, ponds and shallow lake edges are commonly used. In Kentucky, least bitterns have also been found nesting in artificial situations, including reservoirs, waterfowl management impoundments, and fish hatchery brood ponds (Palmer-Ball, 1996). Foraging is in shallow water, mud, and aquatic vegetation (Hamel, 1992).

Hooded Merganser – *Lophodytes cucullatus* – This species of waterfowl requires wooded areas with clear water streams, rivers, swamps, ponds, and lakes with cavity trees present (DeGraaf, 1991). Usually forages in freshwater situations such as swamps, ponds or lakes (Hamel, 1992). This species is seldom found far from floodplain situations and usually requires a good stand of fairly mature forest nearby for nest sites (Palmer-Ball, 1996). They require cavities for nesting and may utilize artificial cavities originally constructed for wood ducks (Bellrose, 1980).

Pied-billed Grebe – *Podilymbus podiceps* – The destruction of wetland habitat has led to a decrease in numbers of this species. Marshes, water impoundments, and shallow edges of lakes

and ponds provide habitat for these birds. Marshy, shallow water with abundant emergent vegetation in which to nest is required during the breeding season. During winter, the birds use similar habitat, but with an increased use of open water. On 13 June 2000, an MSU grad student observed a pied-billed grebe and four young on an USFS-built wetland near Beaver Creek, on the Morehead R.D. (Biebighauser 2001).

Prothonotary Warbler – *Protonotaria citrea* – This species is found in standing water habitats within areas of extensive forest (Hamel, 1992). When birds are seen, they are almost always near the water, where they commonly forage over slow moving streams and rivers. Swamps, riparian corridors, bottomland/floodplains, willow thickets around lakes and ponds, and reservoir margins that contain snags at least 6" dbh in size provide potential habitat for these cavity-nesters. Somewhat open swamps with scattered dead stumps or dead trees with cavities are favored nesting sites.

Bald Eagle – *Haliaeetus leucocephalus* – This federally listed species is dependent on aquatic habitat, primarily river floodplains, lakes, and natural and human-built reservoirs. It utilizes both standing and flowing fresh water sources (and salt water, in coastal areas) that have large trees suitable for nesting, perching and roosting. Suitable trees are at least 20" dbh in size and usually growing near the water (Hamel, 1992). In Kentucky, the birds have nested and wintered around wetland/floodplain habitats and reservoirs resulting from the impoundment of rivers (e.g., Laurel River Lake on the DBNF). Wintering birds are known to occur on major impoundments on the DBNF. Records of attempted nesting exist for Laurel River Lake although no active nests are currently known to exist.

American Woodcock – *Scolopax minor* – This species typically requires moist woodlands in early stages of succession. It may use open fields, cultivated land, pastures and clearings at least ¼ acre in size (DeGraaf et. al., 1991). It generally requires poorly drained soils with an abundance of earthworms for feeding, nearby fields or small forest openings for courtship and roost site (DeGraaf et. al., 1991) and is largely absent from extensive areas of mature forest (Palmer-Ball, 1996). The presences of edge habitat and a high shrub stem density may be important for nest site selection in some areas (NatureServe, 2001). Appears to be partial to sheltered wet thickets along meandering streams (Barbour et. al., 1973). This species may be found feeding around the edges of ponds and lakes where the soil remains damp and a brushy edge is present.

INSECT AND SNAILS

Pygmy Snaketail – *Ophiogomphus howei* – In Kentucky, pygmy snaketail is only known from its aquatic larval stage from the Middle Fork of the Kentucky, Rockcastle, and South Fork of the Rockcastle Rivers. It may only persist in the latter two streams. Apparently more widespread at one time, the Pygmy Snaketail has declined in Kentucky due to impoundments and degraded water quality. This species is common in clean rivers and streams in other parts of the United States. There are rare records of the Pygmy Snaketail from wave-swept shores of lakes, however these conditions are not present on the Daniel Boone.

MAMMALS

Beaver – *Castor canadensis* – Beavers are year-round residents of the river floodplain forest habitat association on the DBNF. They are closely associated with water, normally ranging within about 500 feet of 2nd to 4th order streams. Another important element in beaver habitat is the availability of food, usually fairly young, tender tree species associated with the riparian zones. Young seral stage tree vegetation within 500 feet of creeks and rivers provides an abundant food source. Activities that favor young deciduous growth, such as timber harvest or to some extent prescribed fire, will usually benefit beavers. The diet of the beaver changes throughout the year. From fall to spring beavers rely mainly on woody vegetation although they will use this food throughout the year. During the summer beavers eat a variety of foods including; pondweeds, duckweeds, pond lilies, algae and fleshy rootstocks of many other species, as well as a wide variety of upland or riparian herbaceous plants. Beavers alter stream habitats by their dam construction and create other unique habitats for both terrestrial and aquatic species. Lotic streams are altered to become more lentic systems. Beaver dams provide a shifting mosaic of environmental conditions within stream corridors. Additionally, beavers add much needed large woody debris to stream systems thereby aiding many aquatic organisms which require this habitat component.

PLANTS

Shaggy Hedge-hyssop – *Gratiola pilosa* – is a coastal plain species which extends interior to the Appalachian Mountains and Arkansas. In Kentucky is known only from the southern portion of the DBNF area. Here it occurs on pond margins, wet meadows and seeps along rivers.

Engelmann's quillwort – *Isoetes engelmannii* – is a semi-aquatic species. The plants can survive entirely submerged, or for several months out of water if the soil remains moist. At the time spores are released, the leaf bases must be submerged for sexual reproduction to be successful. The plants are generally in shallow water (under 2 feet deep) and are found in both permanent and seasonal water including ruts, roadside ditches, ponds, lake margins, and occasionally in streamhead wetlands and streams.

Vetchling Peavine – *Lathyrus palustris* – is found on the coastal plain and in the mountains of eastern North America. It is typically found in or at the edge of floodplain forest, swamps, wet meadows or streamside fields, and riverbanks. It may be found along lake or pond margins. On the DBNF, this species occurs on terrace forest of larger streams.

Loesel's Twayblade – *Liparis loeselii* – is a northern and midwestern North American species. It is found in wet to damp forest. On the DBNF, it is known from wet seeps on roadsides, a seep at the base of an abandoned limestone quarry, and at the edge of a strip mine pond.

Shining Ladies'-tresses – *Spiranthes lucida* – is a northeastern to central US species. It is commonly found in damp forest and marshes, and on wet shores. On the DBNF, the species at all sites is found on open limestone streambanks, often in thin mud.

REPTILES

Eastern Ribbon Snake – *Thamnophis sauritus sauritus* – This is a semiaquatic species almost always found close to the shallow water of bogs, marshes, swamps, ponds, streams, and weedy lake shorelines. Other low, wet places in which it is encountered include meadows and grassy roadside ditches. Occupied areas tend to be open, but with an abundance of ground cover, such as grasses and sedges, and bushes in which the snakes can sun themselves. These snakes often climb into low vegetation, although rarely more than 4 feet off the ground (Barbour 1971). When startled, they swim on the surface of the water. Deep water is normally avoided, and fleeing Ribbon Snakes skirt the shore, threading their way through vegetation and getting lost from sight with amazing rapidity (Conant and Collins 1991). Their diet consists of small fish and amphibians.

References:

- Barbour, R.W. 1971. Amphibians and reptiles of Kentucky. The University Press of Kentucky, Lexington, KY.
- Behler, J.L. and F.W. King. 1979. The Audubon Society field guide To North American reptiles and amphibians. Alfred A. Knopf, New York.
- Bellrose, F.C. 1980. Ducks, Geese, and Swans of North America. Wildlife Mangement Institute. Stackpole Books, Harrisburg, P.A. 540 pp.
- Biebighauser, T. 2001. "Uncommon wetland bird observations" Unpublished field notes. USDA Forest Service, Daniel Boone National Forest, Morehead Ranger District.
- Conant, R. and J.T. Collins. 1991. Peterson field guide to reptiles and amphibians: eastern and central North America. 3rd ed. Houghton Mifflin, Boston.
- DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and Rangeland Birds of the United States - Natural History and Habitat Use. USDA Agriculture Handbook 688. 625 pp.
- Hamel, Paul B. 1992. Land Manager's Guide to Birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.
- Mengel, R.M. 1965. The Birds of Kentucky. Ornithological Monographs No. 3, The American Ornithologists' Union, The Allen Press, Lawrence, KS. 581pp.
- Morehead Inventory
- NatureServe: An online encyclopedia of life[web application]. 2001. Version 1.4. Arlington, Virginia, USA: Association for Biodiversity Information. Available: <http://www.natureserve.org/>.
- Neill, W.T. 1963. Hemidactylum scutatum. Cat. Amer. Amphib. Rept.: 2.1-2.2.

Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky, Lexington, KY. 372pp.

Wilson, L.A. 1995. Land manager's guide to the amphibians and reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and The U.S. Forest Service, Southern Region, Atlanta, GA.

Wilson, Lawrence A. 1995. Land manager's guide to the amphibians and reptiles of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC and The U.S. Forest Service, Southern Region, Atlanta, GA. [324 pp.]

07/15/2003

Attachment C.

Pond and Lake Margins Habitat Association Matrix

Association	Habitats	Modifier	Class	Common/Species
15-Lake/Pond Margins	Lake Margins	(blank)	BIRD	Hooded Merganser/ Lophodytes cucullatus
			P-DIC	Vetchling Peavine/ Lathyrus palustris
		Acidic Substrate	P-FER	Quillwort/ Isoetes englemannii
		Forb/Grass Condition	BIRD	American Woodcock/ Scolopax minor
		Forest Interior (Minimal Edge)		Prothonotary Warbler/ Protonotaria citrea
		Moist		American Woodcock/ Scolopax minor
		Rich Soil		American Woodcock/ Scolopax minor
		Rocky/Rocks	INSEC	Pygmy Snaketail/ Ophiogomphus howei
		Sandy Soil		Pygmy Snaketail/ Ophiogomphus howei
		Shrub/Sapling Condition	BIRD	American Woodcock/ Scolopax minor
		Snags > 6" dbh		Wood Duck/ Aix sponsa
				Prothonotary Warbler/ Protonotaria citrea
		Tract Size (Area Sensitive)		Prothonotary Warbler/ Protonotaria citrea
		Tree and Snags (Cavity Nesters)		Wood Duck/ Aix sponsa
				Hooded Merganser/ Lophodytes cucullatus
				Prothonotary Warbler/ Protonotaria citrea
		Trees > 20" dbh		Bald Eagle/ Haliaeetus leucocephalus
		Water (Distance Sensitive)		Wood Duck/ Aix sponsa
				Bald Eagle/ Haliaeetus leucocephalus
				Hooded Merganser/ Lophodytes cucullatus
				Pied-billed Grebe/ Podilymbus podiceps
				Prothonotary Warbler/ Protonotaria citrea
	Pond Margins	(blank)	AMPHI	Four-toed Salamander/ Hemidactylum scutatum
			BIRD	Least Bittern/ Ixobrychus exilis
				Hooded Merganser/ Lophodytes cucullatus
			REPT	Eastern Ribbon Snake/ Thamnophis sauritus sauritus
		Forb/Grass Condition	BIRD	American Woodcock/ Scolopax minor
		Moist		American Woodcock/ Scolopax minor
			P-MON	Loesel's Twayblade/ Liparis loeselii
		Open (Little or No Shade)	P-DIC	Shaggy Hedge-hyssop/ Gratiola pilosa
		Rich Soil	BIRD	American Woodcock/ Scolopax minor
		Seasonal (water)	P-FER	Quillwort/ Isoetes englemannii
		Seep/Constant Water		Quillwort/ Isoetes englemannii
		Shrub/Sapling Condition	BIRD	American Woodcock/ Scolopax minor
		Tree and Snags (Cavity Nesters)		Hooded Merganser/ Lophodytes cucullatus
		Trees > 20" dbh		Bald Eagle/ Haliaeetus leucocephalus
		Water (Distance Sensitive)		Wood Duck/ Aix sponsa
				Bald Eagle/ Haliaeetus leucocephalus

07/15/2003

<u>Association</u>	<u>Habitats</u>	<u>Modifier</u>	<u>Class</u>	<u>Common/Species</u>
				Least Bittern/ Ixobrychus exilis
				Hooded Merganser/ Lophodytes cucullatus
				Pied-billed Grebe/ Podilymbus podiceps